EFFECTIVENESS OF BUERGER ALLEN EXERCISE ON LOWER EXTREMITY PERFUSION AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS IN SELECTED HOSPITALS AT KANNIYAKUMARI DISTRICT

A DISSERTATION SUBMITTED TO THE TAMILNADU

DR. M.G.R MEDICAL UNIVERSITY, CHENNAI IN PARTIAL FULFILLMENT FOR THE DEGREE OF MASTER OF SCIENCE IN NURSING

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INTERNNAL EXAMINER **EXTERNAL EXAMINER**

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES – Cont'd

LIST OF FIGURE

LIST OF ANNEXURE

ABSTRACT

Back ground of the study: Individuals with diabetes mellitus have a two to fourfold increase in the rate of peripheral arterial disease. Peripheral arterial disease is a slow and progressive disease with systemic atherosclerosis. Lower extremity exercise helps to re-establish collateral blood flow to the legs and the heart. The aim of the study is to assess the effectiveness of buerger allen exercise on levels of lower extremity perfusion among patients with type 2 diabetes mellitus in selected hospitals at Kanniyakumari District. **Material and Management:** Quasi experimental with Pre test post test control group design was adopted in this study Non-probability purposive sampling technique was used. Sixty patients with type 2 diabetes mellitus admitted in Maria Diabetic centre and Morris Mathias hospital were grouped in to two groups. Patients in experimental group were given buerger allen exercise for 3 times a day for 5 days, Modified Inlow's 60 second diabetic foot screen scale was used to assess the lower extremity blood circulation. **Results:** In pre test experimental group 14(46.7%) patients had Inadequate perfusion, 16(54.3%) had severely inadequate perfusion and none of them had adequate and moderately adequate perfusion. After the Buerger Allen Exercise level of lower extremity perfusion was decreased and 13(43.3%) patients had adequate level of lower extremity perfusion, 17(56.7%) had moderately adequate perfusion and none of them had inadequate and severely inadequate perfusion in experimental group. There was significant reduction in mean post test perfusion score (MD=8.13,t=32.43,p=0.001) of the experimental group. The mean post test perfusion score in experimental group lesser than the post test perfusion score of control group (MD=7.73,t=16.17,p=0.001). **Conclusion:**The majority of the patients in type 2 Diabetus mellitus had shown significant improvement in the levels of lower extremity perfusion through Buerger Allen Exercise.

CHAPTER I

INTRODUCTION

To enjoy the glow of good health,

You must exercise

- Gene Tunney

BACKGROUND OF THE STUDY

Healthy life is the valuable gift of an individual, if a person is healthy enough, he is the richest person in his own world."Healthy living" to most people means both physical and mental health are in balance or functioning well together in a person. In many instances, physical and mental health are closely linked, so that a change (good or bad) in one directly affects the other Physical activity and exercise is a major contributor to a healthy lifestyle; people are made to use their bodies, and disuse leads to unhealthy living. Unhealthy living may manifest itself in obesity, weakness, lack of endurance, and overall poor health that may foster disease development. Physical inactivity and lack of exercise are associated with type II diabetes mellitus (also known as maturity or adult-onset, non-insulin-dependent diabetes (Mohammed E., 2013)

Diabetes is the most common metabolic disorder affecting populations in all geographical regions of the world. The prevalence of diabetes is influenced by genetic, ethnic and socioeconomic factors. The World Health Organization (WHO) has projected that the prevalence of diabetes is increasing in epidemic proportions especially in developing countries. India has the highest number of people with Diabetes in the World.

Globally, it is estimated 422 million adults are living with diabetes mellitus, according to the latest 2016 data from the World Health Organization (WHO). Diabetes prevalence is increasing rapidly; previous 2013 estimates from the International Diabetes Federation put the number at 381 million people having diabetes. The number is projected to almost double by 2030. Type 2 diabetes makes up about 85-90% of all cases.

Increases in the overall diabetes prevalence rates largely reflect an increase in risk factors for type 2, notably greater longevity and being overweight or obese.

Until recently, India had more diabetics than any other country in the world, according to the International Diabetes Foundation, although the country has now been surpassed in the top spot by China. Diabetes currently affects more than 62 million Indians, which is more than 7.1% of the adult population. The average age on onset is 42.5 years.Nearly 1 million Indians die due to diabetes every year. India is one of the 6 countries of the International Diabetic Federation - South East Asia region. 425 million people have diabetes in the world and 82 million people in the South East Asia region; by 2045 this will rise to 151 million. There were over 72 million cases of diabetes in India in 2017.

One out of 10 people in Tamil Nadu is diabetic, and every two persons in a group of 25 are in the pre-diabetic stage. These statistics from phase 1 of the Indian Council of Medical Research's INDIAB

Diabetes mellitus is a group of metabolic disease, characterized by hyperglycemia resulting from defect in insulin secretion, insulin action or both. The basis of the abnormalities in carbohydrate, protein, and fat metabolism in diabetes is a deficient action of insulin on the target tissue of skeletal muscle, adipose tissue, and liver. Uncontrollable DM may result in long term damage, dysfunction and failure of various organs especially the heart, kidney and eyes. The new system reflects the etiology and pathophysiology of diabetes with two major categories being type 1 diabetes mellitus and type2 diabetes mellitus. Their end result in hyperglycemia. Type 1 is caused by lack of insulin production by beta cells. Type 2 is the most common and is caused by deficiency or inadequacy of insulin receptors in cells. (Brunner and Suddarth.,2008)

Type 2 diabetes mellitus can be easy to ignore, especially in the early stages. But type 2 diabetes mellitus affects many major organs including heart, blood vessels, nerves, eyes and kidneys. Control the blood sugar levels can help to prevent these complications. Although long term complications of diabetes develop gradually, client can eventually be

disabling or even life threatening. Some of the potential complications of diabetes includes heart and blood vessel disease, nerve damag(neuropathy),eyedamage(retinopathy),kidneydamage(nephropathy),foot damage, hearing impairment, lower extremity amputation and Alzheimer's disease. (Lewis.,2008)

In people with diabetes, the risk of Peripheral arterial disease is increased by age, duration of diabetes, and presence of peripheral neuropathy. African Americans and Hispanics with diabetes have a higher prevalence of Peripheral arterial disease than non-Hispanic whites, even after adjustment for other known risk factors and the excess prevalence of diabetes. It is important to note that diabetes is most strongly associated with femoral-popliteal and tibial (below the knee) Peripheral arterial disease.

At present, there are no established guidelines regarding the care of patients with both diabetes and Peripheral arterial disease. Peripheral arterial disease is a manifestation of atherosclerosis characterized by atherosclerotic occlusive disease of the lower extremities and is a marker for atherothrombotic disease in other vascular beds. Peripheral arterial disease affects ~12 million people in the U.S. it is uncertain how many of those have diabetes. Data from the Framingham Heart study revealed that 20% of symptomatic patients with Peripheral arterial disease had diabetes, but this probably greatly underestimates the prevalence, given that many more people with Peripheral arterial disease are asymptomatic rather than symptomatic. As well, it has been reported that of those with Peripheral arterial disease, over one-half are asymptomatic or have atypical symptoms, about one-third have claudication, and the remainder have more severe forms of the disease .(Marso, p. et al.,2010)

Peripheral artery disease most commonly affects the legs, but other arteries may also be involved. The classic symptom is leg pain when walking which resolves with rest, known as intermittent claudication. Other symptoms including skin ulcers, bluish skin, cold skin, or poor nail and hair growth may occur in the affected leg. Complications may include an infection or tissue death which may require amputation Peripheral arterial disease is a condition characterized by atherosclerotic occlusive disease of the lower extremities. While Peripheral arterial disease is a major risk factor for lower-extremity

amputation, it is also accompanied by a high likelihood for symptomatic cardiovascular and cerebrovascular disease. Although much is known regarding Peripheral arterial disease in the general population, the assessment and management of Peripheral arterial disease in those with diabetes is less clear and poses some special issues. At present, there are no established guidelines regarding the care of patients with both diabetes and Peripheral arterial disease. (Ashok, p. et al 2013)

Peripheral arterial disease is a complication of diabetes that happens when blood vessels in the legs become blocked or narrowed due to fat deposits. The result is reduced blood flow to the feet and legs. The condition affects around 1 in 3 people with diabetes over the age of 50, and increases the risk of heart attack and stroke.

Perfusion is the passage of fluid through the circulatory system or lymphatic system to an organ or a tissue, usually referring to the delivery of blood to a capillary bed in tissue. Heart tissue is considered over perfusion because they normally are receiving more blood than rest of tissue in organism; they need this blood because they are constently working. Peripheral arterial disease is one of the leading conditions that can alter perfusion and thereby increase susceptibility to localized tissue ischemia, contributing to delay healing of lower extremity ulcers. Peripheral arterial disease is primarily caused by progressive atherosclerotic changes in the arteries reducing normal blood flow to the lower extremities Diabetes causes significant and extensive structural changes in the vascular system, increasing the risk of developing atherosclerosis (large- and medium-sized arteries) and inducing a specific lesion in microcirculation (small vessels). Hyperglycemia is responsible for the excess production of reactive oxygen species that damage and interfere with normal endothelial functions.(Pert-Jerodlyceff.,2015)

Exercise is physical activity that is planned structured and repetitive for the purpose conditioning any part of the body. Exercise is used to improve health, maintain fitness and is important as a means of physical rehabilitation. Exercise is the fundamental principle for preventing the peripheral vascular disease among diabetes patients. One of the exercise is Buerger allen exercise, is an active postural exercise of

the feet and legs for preventing peripheral vascular disease and promoting collateral circulation in lower extremities.(Edward,B et al,2009)

Before and after World War II, medical experts did not know how to operate or treat the patient suffering from atherosclerosis or vessel occlusion, as well as stiffening in their peripheral arteries. Some medical genius at that time developed postural treatment to improve circulation in the lower extremities. Buerger's exercises or Buerger-Allen exercises were proposed by Leo Buerger and modified by Arthur Allen. The value of these exercises had frequently been emphasized by Allen, and many medical experts considered them as important adjuvant treatment and postoperative care for circulatory disturbances in the extremities.

The mechanism of Buerger's exercises use gravitational changes in positions that are applied to the smooth musculature of vessels and to the vascular Gravity helps alternately to empty and fill blood columns, which can eventually increase transportation blood.It has been considered as a strategy for improving lower extremity perfusion. However, lack of evidenced- based studies to support. It was increase the rate of blood flow, clear away stagnant blood and help establish collateral circulation to the ischemic area. it can prevent and treat diabetic foot problems, shortened any period of hospitalization, and delayed morbidity . Furthermore, the beneficial effects of Buerger's exercises in patients with diabetic foot problems. These effects are due to improving neuropathy, infection, pain, and arteriosclerosis with or without gangrene. Buerger's exercises are seen as a conservative treatment of the peripheral vascular disease, low cost and low risk physical activity that most diabetes patients could undertake at home. Therefore, the objective of this study was to systematically review the evidence for the effectiveness of Buerger's exercise on the peripheral circulation or diabetic foot ulceration. (Allen, A.W 1999)

Nurses play very important role in improving lower extremity perfusion among type 2 Diabetes mellitus patients. Buerger Allen exercise is easy to perform without any risk and without any expenses, the obvious substantiation that Buerger Allen exercise improves the lower extremity perfusion.

NEED FOR THE STUDY

Diabetes mellitus, known commonly as diabetes, is a disease that occurs when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces. Individuals with diabetes mellitus have a two to fourfold increase in the rate of peripheral arterial disease. People with long standing Diabetes mellitus develop complication of Peripheral Arterial Disease. Peripheral Arterial Disease leads to grave complication like gangrene in the lower limbs

The most common symptom is muscle pain in the lower limbs on exercise. In diabetes, pain perception may be blunted by the presence of peripheral neuropathy. Therefore, a patient with diabetes and peripheral arterial disease is more likely to present with an ischemic ulcer or gangrene than a patient without diabetes. The use of ankle-brachial-pressure index in the clinic and bedside provide a measure of blood flow to the ankle. This could help early detection, initiate early therapy and may thus reduce the risk of critical limb ischemia and limb loss. Buerger Allen Exercise is one of the interventions to stimulate the development of collateral circulation in the legs.

Diabetes mellitus occurs throughout the world, but is more common (especially type 2) in the more developed countries. The greatest increase in prevalence is, however, occurring in low- and middle-income countries including in Asia and Africa, where most patients will probably be found by 2030. The increase in incidence in developing countries follows the trend of urbanization and lifestyle changes, including increasingly sedentary lifestyles, less physically demanding work and the global nutrition transition, marked by increased intake of foods that are high energy-dense but nutrient-poor (often high in sugar and saturated fats, sometimes referred to as the Western pattern diet). The risk of getting type 2 diabetes has been widely found to be associated with lower socio-economic position across countries. (Escol.,2014)

Global prevalence of diabetes mellitus (DM) in adults has been estimated at 8.3% in 2011 and will rise to 9.9% by 2030, affecting over 350 million individuals. Diabetic foot complication is a major cause of disability, reduced quality of life, prolonged

hospitalization, financial loss, lower limb amputation, and mortality rate. People with diabetes develop foot ulcers because of neuropathy, vascular insufficiency, and impaired wound healing. Nearly 90% of diabetes-related lower limb amputations were preceded by foot ulcers. In addition, conventional treatments such as operation and infection control to cure diabetic foot ulcers are often ineffective. (King H.,2004)

The Indian Diabetes federation estimated 381 million people have Diabetes Globally in 2013 by 2035 this will rise to 592 million .The number of people with type 2 diabetes is increasing in every country and 80% of people with diabetes live in low- and middle-income countries. The greatest number of people with diabetes is between 40 and 59 years of age 3. India currently has 62.4 million people with diabetes and is home to the second highest number of people living with diabetes in the world. In India and other developing countries, the amputation rate is about 45% for peripheral arterial disease due to diabetes mellitus. In India, the recent Indian Council of Medical Research-Indian Diabetes study reported the prevalence of diabetes mellitus and related lower extremity arterial disease (both known and newly diagnosed) in 4 regions of the country: 10.4% in Tamilnadu, 8.4% in Maharashtra, 5.3% in Jharkhand, and 11.6% in Chandigarh (Union Territory). In Chennai the incidence of peripheral arterial disease is about 6-8 per cent among diabetes mellitus patients who come to the outpatient unit. In those who are over 60 years, it is higher at 30 percent. (The Hindu. 2011, Sep 6)

The WHO estimates that diabetes resulted in 1.5 million deaths in 2012, making it the 8th leading cause of death. However another 2.2 million deaths worldwide were attributable to high blood glucose and the increased risks of associated complications (e.g. heart disease, stroke, kidney failure), which often result in premature death and are often listed as the underlying cause on death certificates rather than diabetes.

In 2015 about 155 million people hadperipheral arterial disease worldwide. In the developed world it affects about 5.3% of 45 to 50 years olds and 18.6% of 85- to 90-year-olds.In the developing world it affects 4.6% of people between the ages of 45 to 50 and 15% of people between the ages of 85 to 90. In the developed world peripheral arterial disease is equally common among men and women while in the developing world

women are more commonly affected. In 2015 peripheral arterial disease resulted in about 52,500 deaths up from 16,000 deaths in 1990.

There are various strategies for organizing and prioritizing the vast amount of information that must be thought to patients with diabetes. In addition, many hospitals and out patient diabetes centres have divised written guidelines, care plans and documentation forms that may be used to document and evaluate teaching. One approach is to organize education using the seven tips for managing diabetes identified and developed by the American Association of Diabetes Educators(2004). They are healthy eating, being active, monitoring, taking medicines, problem solving, reducing risks, healthy coping.(Brunner and Siddarth.,2008)

A study to assess the effectiveness of Buerge Allen exercise on level of lower extremity perfusion among type 2 diabetes mellitus patients in experimental group. During clinical posting in the Saveetha Medical College Hospital Chennai, the investigator came acrossmanypatient with type II diabetes mellitus who is suffered from a peripheral artery disease due to inadequatelower extremity perfusion and in helpless situation due to lack of knowledge regarding management of peripheral artery disease. By this experience, the investigator felt that nurses has an important role in educating the patients regarding supervised exercise like Buerger'sAllen Exercise. Quasi Experimental pre – test and post test design. Non probability convenient sampling technique was used. A total of 60 admitted patients participated in the study. ABPI Scale was used toassess the level of lower extremity perfusion for data collection. Result: There is a significant improvement in the level of lower limb perfusion in experimental group after Buerger Allen exercise than the control group among patient with type 2 diabetes mellitus at ($p<0.001$). Conclusions: This study indicates that Buerger Allen Exercise is a simple non pharmacological and effective method for the management of lower limb perfusion among the patient with type 2 diabetes mellitus.

A study was conducted to quantify the distribution of the peripheral vascular disease in diabetics and non - diabetic patients attending angiography, to compare severity and the outcome between both groups of patients. The study was conducted in

136 patients and 58(43%) patients were diabetic. This study confirmed that diabetic patients have more worsened peripheral vascular disease and are at high risk of lower extremity amputation than non-diabetes patients. Diabetes patients with peripheral vascular disease also had high mortality and died at a younger age than non-diabetes patient (Edwin Stephen., 2011)

Considering the above factors the investigator found that many clients with diabetes mellitus have increase in the rate of peripheral arterial disease and arthero sclerosis, The clients expressed that they need an intervention to improve lower extremity perfusion, prevent diabetic foot ulceration, reducing venous embolism, pain, swelling, cyanosis and necrosis. Based on the review of literature buerger allen exercise improves the collateral perfusion, so investigator planned to conduct a study to improve lower extremity perfusion among type 2 diabetes mellitus patients.

PROBLEM STATEMENT

A study to assess the effectiveness of buerger allen exercise on lower extremity perfusion among patients with type 2 diabetes mellitus in selected hospitals at Kanniyakumari District.

OBJECTIVES;

- To assess the levels of lower extremity perfusion among patients with type 2 diabetes mellitus in both experimental and control group.
- To find out the effectiveness of buergerallen exercise on levels of lower extremity perfusion among patients with type 2 diabetes mellitus.
- To determine the association between the post test levels of lower extremity perfusion among patients with type 2 diabetes mellitus and the selected demographic variables such age, sex, marital status, religion, education, dietary pattern, type of job.
- To determine the association between the post test levels of lower extremity perfusion among patients with type 2 diabetes mellitus and the selected clinical variables suchduration of diabetes mellitus, associated illness, and family history of peripheralarterydisease .

HYPOTHESIS

H_1; The mean post test score of lower extremity perfusion will be significantly lower than the mean pre test of score lower extremity perfusion in experimental group who had buergerallen exercise

H_2; The mean post test score of lower extremity perfusion among patients with type2 diabetes mellitus in experimental group will be lower than the mean post test score of lower extremity perfusion in control group.

H_3; There will be significant association between the post test score of lower extremity perfusion among patients with type2 diabetes mellitus and selected demographic variables such as age, sex, marital status, religion, education, dietary pattern, and type of job.

H_4; There will be significant association between the post test score of lower extremity perfusion among patients with type2 diabetes mellitus and selected demographic variables such as duration of diabetes mellitus, associated illness, and family history of peripheral artery disease

OPERATIONAL DEFINITION

1. Effectiveness

The degree to which something is successful in producing a desired result; success

In this study it refers to the significant difference in level of lower extremity perfusion before and after buergerallen exercise among patients with type 2 diabetes mellitus, as measured by Modified inlow's 60 second diabetic foot screen scale

2. Buerger Allen exercise

Buerger allen exercise intended to improve circulation to the feet and legs. also relieve the symptoms in patients with lower limbs arterial insufficiency. (Buerger,1996)

In this study it refers to the exercise intended to improve circulation to the feet and legs. Buerger allen exercise was given for 20 minutes three times per day with 3 hours interval for the period of 5 days

3.Lower extremity perfusion

Perfusion is the passage of fluid through the circulatory system or lymphatic system to an organ or a tissue, usually referring to the delivery of blood to a capillary bed in tissue.(Thomson Reuter.,20110)

In this study Lower extremity perfusion refers to blood circulation to the lower extremity assessed before and after the intervention measured by Modified Inlow's 60 second diabetic foot screen scale

It involves the assessment level of lower extremity perfusion

Score 0 – 3 Adequate perfusion

Score 4 – 8 Moderately Adequate perfusion

Score 9 – 13 Inadequate perfusion

Score 14 – 18 Severely inadequate perfusion

4.Type 2 diabetes mellitus

Type 2 diabetes mellitus consists of an array of dysfunctions characterized by hyperglycemia and resulting from the combination of resistance to insulin action, inadequate insulin secretion, and excessive or inappropriate glucagon secretion. (Brinda Nichols., 2008)

In this studyit refers to, patients both men and women of age between 45-85 years whohave been diagnosed to have type 2 diabetes mellitus.

ASSUMPTIONS

- Type 2 diabetes mellitus patients experience hypo and hyper perfusion.

- Buerger Allen exercise is one of the effective method of treatment for improving lower extremity perfusion, walking ability, reducing necrosis, reducing venous embolism, pain swelling and cyanosis.
- Buerger Allen exercise has no side effects.

.DELIMITATIONS

The study is limited to

- Patients with type 2 diabetes mellitus
- Age group between 45-85 years
- Data collection period limited to 4 weeks only
- Sample size of 60 only.

PROJECTED OUTCOME

- Buerger Allen exercise will have effectiveness on improving lower extremity perfusion and facilitate the sense of wellbeing among the patients with type 2 diabetes mellitus.
- Buerger Allen exercise will be effective in reducing swelling and pain
- Buerger Allen exercise will have effectiveness in reducing venous embolism, necrosis and cyanosis

CONCEPTUAL FRAME WORK

Conceptualization is the process of forming ideas, designs and plans. Conceptual frame work deals with abstractions that are assembled by virtue of their relevance to a common theme. The present study aimed to evaluate the effectiveness of Buerger Allen Exercise on level of lower extremity perfusion among selected type 2 diabetes mellitus patient.

The conceptual framework set up for the study was modified model of Stuffle Beam's evaluation model planned pogramme. Daniel stuffle Beam's CIPP(context, input, process and product) Model´ prescribes four areas of evaluation, context, input, process

and product. It provides a comprehensive, systematic and continuously ongoing framework for programme evaluation.

Step I : Context evaluation

Step II: Input evaluation

Step III: Process evaluation

Step IV: Product evaluation

The core value for present study was to enhance the Buerger Allen Exercise on levels of lower extremity perfusion among patient with selected type 2 diabetes mellitus patient.

Context evaluation

The context evaluation assess the needs, problems, assets and opportunities to help decision makers to define goals and priorities and help the broader group of users to judge goals, priorities and outcomes. The goal of a present study was to assess the level of lower extremity perfusion and practice of Buerger Allen Exercise. The patients with Diabetes Mellitus have the risk of Peripheral Vascular Disease, So ABI scale and Modified Inlow's 60 second diabetic foot screen scale was prepared by the researcher to find the level of lower extremity perfusion.

Input evaluation

It involves the steps and resources needed to meet the goals and objectives and might include identifying successful external programmes and materials as well as gathering information. The input evaluation assess the alternative approaches, competing action plans, cost effectiveness to meet targeted needs and achieve goals.The input evaluation step prepared the Demographic profiles and to measure the lower extremity perfusion by ABI Scale and Modified Inlow's 60 second diabetic foot screen scale was prepared to assess the effectiveness of Buerger Allen Exercise on levels of lower extremity perfusion. The investigator prepared the demonstration of Buerger Allen Exercise and, planned to achieve the goals and objectives of the study.

Process evaluation

Process evaluation assess the implementation of plans to help the investigator carryout activities and later help the broad group of users, judge the program performance and interpret outcomes.

Action done in the step was pretest assessment of lower extremity perfusion of patients with selected type 2 diabetes mellitus patients using the Ankle Brachial Index Scale and Modified Inlow's 60 second diabetic foot screen scaleprepared by the researcher. Buerger Allen exercise was administered five days in three times per day. The lower extremity perfusion was reassessed on sixth day, after administration of Buerger Allen Exercise.

Product evaluation

The product evaluation identifies and assesses outcomes of short term and long term both intended and unintended, which help the investigator to keep an enterprise focused on achieving important outcomes and ultimately to help the broader groups in meeting targeted needs. The level of lower extremity perfusion improved after administration of Buerger Allen Exercise among patients with selected type 2 diabetes mellitus patients. The risk of Peripheral vascular disease is reduced and also the patients with selected type 2 diabetes mellitus patientswill be able to practice Buerger Allen Exercise regularly.

CHAPTER : 2

REVIEW OF LITERATURE

Review of literature is systematic identification, critical analysis and reporting of existing information on the topic of material for the study. The review of literature is a key step in research process excessive review of literature relevant to research was alone to collect maximum information for laying foundation of this study. The purpose of review of literature is to gain maximum relevant information and perform the study in a scientific manner.

Literature relevant for this study has been organized in the following sequences;

Section I :General informationrelated to patients with type 2 diabetes mellitus and Peripheral vascular disease

Section II : Studies related to diabetes mellitusandperipheral vascular disease

Section III : Generalinformationrelated toBuerger's Allen exercise

Section IV : Studies related toBuerger's Allen exercise

Section V : Studies related to effectiveness of Buerger's Allen exercise on lower extremity perfusion.

Section I

General information related to patients with type 2 diabetes mellitus and peripheral vascular disease

Type 2 diabetes mellitus

Introduction

Type 2 diabetes mellitus is the most common type of diabetes. It is a chronic problem in which blood glucose (sugar) can no longer be regulated. There are two reasons for this. First, the cells of the body become resistant to insulin (insulin resistant). Insulin works like a key to let glucose (blood sugar) move out of the blood and into the

cells where it is used as fuel for energy. When the cells become insulin resistant, it requires more and more insulin to move sugar into the cells, and too much sugar stays in the blood. Over time, if the cells require more and more insulin, the pancreas can't make enough insulin to keep up and begins to fail.

Definition

Type 2 diabetes mellitus is a adult ,and non insulin dependent in it the two main problems related to insulin in type 2 diabetes are insulin resistant and impaired insulin secretion. Insulin resistant refers to a insulin do not bind with the special receptor on cell surface and mpaired insulin secretion refers to insulin secretion glands release irregular amount of insulin.(Brunner & Suddarth.,2007)

Causes

The development of type 2 diabetes is caused by

- Compination of lifestyle and genetic factors
- Peresonal factors such as obesity and diet
- Lack of sleep has been linked to type 2 diabetes

Other factors such as,

- High blood pressure
- Smoking
- Sedentry lifestyle
- High fat and cholesterol
- Over weight

Signs and symptoms

- Polyuria (frequent urination)
- Polydipsia (increased thirst)
- Polyphagia (increased hunger)
- Weight loss

- Blurred vision
- Itching
- Peripheral neuropathy
- Hyperosmolar hyperglycemic state

Diagnosis of type 2 diabetes

- The blood is tested for glucose and if it is greater than 125 fasting, or more than 200 when randomly tested, the diagnosis is diabetes If the fasting blood sugar is between 100-125, the person has a diagnosis of pre-diabetes.
- Tests also can measure average blood sugar over time. Hemoglobin A1c (HbA1c) test greater than 6.5% indicates the diagnosis of the disease. Pre-diabetes is diagnosed with an HbA1c of 5.7% - 6.4%

Prevention of diabetes mellitus type 2

Onset of type 2 diabetes can be delayed or prevented through proper nutrition and regular exercise. Intensive lifestyle measures may reduce the risk by over half. The benefit of exercise occurs regardless of the person's initial weight or subsequent weightloss. High levels of physical activity reduce the risk of diabetes by about 28%. Evidence for the benefit of dietary changes alone, however, is limited, with some evidence for a diet high in green leafy vegetables and some for limiting the intake of sugary drinks In those with impaired glucose tolerance, diet and exercise either alone or in combination with metformin or acarbose may decrease the risk of developing diabetes. Lifestyle interventions are more effective than metformin. A 2017 review found that, long term, lifestyle changes decreased the risk by 28%, while medication does not reduce risk after withdrawal. While low vitamin D levels are associated with an increased risk of diabetes, correcting the levels by supplementing vitamin D3 does not improve that risk.

Treatment for type 2 diabetes

Treatment for this type of diabetes can include:

- Diabetic eating plan
- Exercise
- Weight loss
- Oral drugs
- Injectable drugs
- Treating other problems like stress or sleep apnea
- Dietary supplements

Not all people with diabetes need drug therapy. A healthy eating plan and exercise alone can be enough if the person makes significant lifestyle changes. Other signs, symptoms, and complications also may need treatment. For example, nutritional deficiencies should be corrected, heart or kidney disease may need to be treated, and vision must be checked for eye problems like diabetic retinopathy.

Peripheral arterial disease

Introduction

Peripheral artery disease (PAD) is the narrowing of the arteries to the legs, stomach, arms and head. PAD (also called PVD, or peripheral vascular disease) is most common in the arteries in the pelvis and legs. It is a form of atherosclerosis (cholesterol build-up) caused by the collection of fatty deposits and other substances in the arteries. Many people with PAD have little or no symptoms. Others have pain in their legs while they walk. The pain usually goes away when they rest.

Definition

Peripheral vascular disease (PVD) is a blood circulation disorder that causes the blood vessels outside of heart and brain to narrow, block, or spasm. This can happen in arteries or veins. PVD typically causes pain and fatigue, often in legs, and especially during exercise. The pain usually improves with rest.(Lowerence.H.,2013)

Risk factors

Factors that increase the risk of developing peripheral artery disease include:

- Smoking
- Diabetes
- Obesity (a body mass index over 30)
- High blood pressure
- High cholesterol
- Increasing age, especially after reaching 50 years of age
- A family history of peripheral artery disease, heart disease or stroke
- High levels of homocysteine, a protein component that helps build and maintain tissue

Types of Peripheral vascular disease

The two main types of PVD are functional and organic PVD.

- Functional PVD means there's no physical damage to your blood vessels' structure. Instead, your vessels widen and narrow in response other factors like brain signals and temperature changes. The narrowing causes blood flow to decrease.

- Organic PVD involves changes in blood vessel structure like inflammation, plaques, and tissue damage**.**

Peripheral vascular disease symptoms include:

- Painful cramping in your hip, thigh or calf muscles after certain activities, such as walking or climbing stairs (claudication)
- Leg numbness or weakness
- Coldness in your lower leg or foot, especially when compared with the other side
- Sores on your toes, feet or legs that won't heal
- A change in the color of your legs

- Hair loss or slower hair growth on your feet and legs
- Slower growth of your toenails
- Shiny skin on your legs
- No pulse or a weak pulse in your legs or feet
- Erectile dysfunction in men

Prevention

Avoid smoking

Smoking harms the blood vessels in many ways, raising the risk for:

- Atherosclerosis, or hardening of the arteries. This happens when a hard substance called plaque builds up inside the artery walls, making them narrow and stiff. Atherosclerosis is linked to serious conditions like heart attack and stroke.
- Abdominal aortic aneurysm, a bulge or weak spot in the main artery in the abdomen. If an aneurysm ruptures (or bursts), it can cause life-threatening internal bleeding.
- Deep vein thrombosis (DVT), a dangerous blood clot in a vein. If a piece of the clot breaks loose, it can travel to your heart, lungs, or brain, causing life-threatening problems like heart attack, pulmonary embolism, and stroke.
- Peripheral artery disease , which happens when the blood vessels in the legs become narrow or blocked. If left untreated, PAD can lead to limb loss.
- Stroke, a potentially life-threatening condition that happens when blood flow to your brain is blocked.

Exercise Regularly.

Regular physical activity can lower the risk for vascular disease

- **Blood pressure.** High blood pressure damages blood vessels and raises the risk for atherosclerosis and stroke.

- Our body needs cholesterol to work the right way, but too much can build up in the arteries and lead to atherosclerosis, which raises the risk for heart attack, PAD, and stroke.

- **Blood sugar level.** Blood sugar is linked to diabetes, which changes the chemistry of blood and make the blood vessels narrow.

Set a goal to achieve 30 minutes of physical activity each day

Choose healthy foods

A healthy diet goes a long way for the blood vessels by helping to control risk factors like high blood pressure, high cholesterol, and diabetes. Choose a balanced diet that includes:

- A variety of colorful fruits and vegetables
- Whole grains
- Lean meat and poultry
- Fish
- Beans
- Low-fat or fat-free dairy products

Follow the treatment plan for diabetes, high cholesterol, and high blood pressure.

Health conditions like diabetes, high cholesterol, and high blood pressure are linked to vascular disease, so it's important to follow the treatment plan.

Take the medicines as doctor prescribes and talk about the changes need to make the lifestyle, such as getting more physical activity, choosing healthier foods, quitting smoking, or finding healthy ways to cope with stress.

Keep regular appointments with doctor to monitor the weight, blood pressure, cholesterol, and blood sugar level.

Section II :

Studies related diabetes mellitus and peripheral vascular disease

M.Á.Tresierra-AyalaA.García Rojas.,(2017) conducted a study related association between peripheral arterial disease and diabetic foot ulcers in patients with diabetes mellitus type 2. A cross-sectional study was carried out at Hospital Belen of Trujillo, which all patients with type 2 diabetes mellitus ≥50 years were included. Presence or

absence of both variables was measured in the study.Three hundred twenty-two patients were included in the study. We found that 129 patients had peripheral arterial disease and diabetic foot ulcers (OR 3, 95% IC 1.087–8.242 and $p < 0.001$).In this study, peripheral arterial disease was associated with diabetic foot ulcer in patients with type 2 diabetes mellitus.

A cross-sectional study was conducted by Cheng-Chieh Lin., 2015 to a well established and non-invasive radionuclide method to objectively evaluate the anterior tibial muscle perfusion of 120 type II DM patients without symptoms/signs of peripheral vasculardisease (PVD) in the lower extremities at Beijing, China. The patients were separated into groups according to the duration of the disease and condition of blood sugar control. Meanwhile, 60 normal control males with a matched age distribution were also included for comparison. The muscle perfusion were of significant difference between (1) 120 type II DM patients and 60 normal controls, (2) 72 patients with good sugar control and 48 patients with poor sugar control, as well (3) 64 patients with short disease duration and (4) 56 patient with long disease duration. Based on the objective radionuclide method, study concluded that the muscle perfusion in the lower extremities of type II DM patients without symptoms/signs of PVD is significantly decreased and related to the duration of the disease and condition of blood sugar control.

Hasan A Alzahraniand Dong Wong (2014) conducted a study to identify risk factors for peripheral artry disease among patients with diabetes in Saudi Arabia. therefore investigated the association of traditional and non-traditional PAD risk factors, as well as clinical markers, with the prevalence of PAD in 598 diabetic patients in Saudi Arabia.peripheralartry disease was diagnosed as an ankle–brachial index (ABI) <0.9. Information on socio-demographic variables, smoking status, duration of diabetes, and medication were collected by questionnaire. Body weight, height, blood pressure and clinical markers were also measured. The prevalence of PAD in this population was 23.1%. Hypertension , obesity and longer duration of diabetes were independently and significantly associated with a higher prevalence of PAD. Participants with the highest quartile of fasting blood glucose and homocysteine levels had a 67% higher prevalence of ,peripheral artry disease respectively. The study identified several important and largely

modifiable risk factors for peripheral artry disease in Saudi population with diabetes. These findings underscored the importance of reducing cardiovascular risk factors in patients with diabetes.

A study to determine the prevalence of peripheral arterial disease in type 2 diabetes mellitus using the ankle-brachial pressure index and to educate the patients regarding risk factor modification and importance of early intervention to prevent future progression was conducted in Punjab was conducted by Ashok Khurana (2013) A 12 MHz Doppler probe was used in the arms and legs to assess the ankle brachial index (ABI) in 200 type 2 diabetes mellitus patients aged more than 40 years. A thorough history of patients including age, smoking history, history of symptoms of peripheral arterial disease, complete physical examination, and routine investigations were collected at the time of enrolment for all subjects. A ratio of the highest blood pressure from the posterior tibial or pedal arteries of each leg to the highest blood pressure from the brachial arteries < 0.9 was considered abnormal. Abnormal ABIs were found in 33% (66/200) patients with type 2 diabetes mellitus. 45.5% patients had ABI 0.80 - 0.89, 33.3% patients had ABI 0.50 - 0.79, and 21.2% patients had ABI < 0.5. Prevalence of peripheral vascular disease in type 2 diabetes mellitus is on rise in northern India

Dong wang (2012) A descriptive cross sectional study was undertaken to determine the prevalence and associated clinical factors of PAD in adult ambulatory diabetic patients attending the outpatient diabetic clinic of Mulago national referral and teaching hospital, Kampala Uganda. In this study 146 ambulatory adult diabetic patients were studied. Measurement of ankle brachial index (ABI) to assess for PAD, defined as a ratio less than 0.9 was performed using a portable 5±10 MHz Doppler device. The mean age/standard deviation of the study participants was 53.9/12.4 years with a male predominance (75, 51.4%). PAD was prevalent in 57 (39%) study participants. Of these, 34 (59.6%) had symptomatic PAD. The noted clinical factors associated with PAD in this study population were presence of symptoms of intermittent claudication and microalbuminuria. This study documents a high prevalence of PAD among adult ambulatory Ugandan diabetic patients.

A cross sectional study to assess the lower extremity function and dysfunction in peripheral artery disease (PAD) patients with and without diabetes was conducted by Nancy C. Dolan (2012) In this study, 460 men and women with PAD (147 with diabetes) were recruited from three academic medical centers. Assessments included ankle brachial index (ABI), neuropathy score, 6-min walk distance, 4-m walking velocity, Walking Impairment Questionnaire (0±100 scale, 100 = best), and summary performance score (SPS) (0±12 scale, 12 = best). The mean ABI was similar in PAD patients with and without diabetes. PAD patients with diabetes were younger, had a higher BMI, had a worse neuropathy score, and had a greater number of cardiovascular comorbidities compared with those without diabetes. Participants with diabetes were less likely to report classical symptoms of intermittent claudication and more likely to report exertional leg pain, which sometimes started at rest. After adjusting for age, those with diabetes had a shorter mean 6-min walk distance (1,040 vs. 1,168 feet, $P < 0.001$), slower fast-pace 4-m walk velocity (0.83 vs. 0.90 m/sec, $P< 0.001$), and a lower SPS (7.3 vs. 8.6, $P < 0.001$) than those without diabetes. Patients with diet-controlled diabetes performed better than those on diabetes medications. Differences in lower extremity functioning between patients with and without diabetes were largely attenuated but not abolished for SPS and fast-pace 4-mwalk velocity after adjustment for type of exertional leg pain, neuropathy score, and number of cardiovascular comorbidities. Subjects with PAD and diabetes have poorer lower extremity function than those with PAD alone.

Section III

General information related to Buerger's Allen exercise

Introduction

Buerger exercises is a system of exercises for arterial insufficiency of lower limbs, consisting of legs elevation, followed by dependency of the legs, and finally horizontal position of legs for rest. Published in 1924 by Leo Buerger (1879-1943), New York physician.Buerger exercises augmented by active exercises of the feet. These exercises consist in flexion, extension, and circumduction of the ankles and are done during the phase of dependency of the legs, as suggested in 1931 by Arthur W. Allen (1887-1958)

Definition:

Buerger Allen exercise is an specific exercises intended to improve circulation to the feet and legs.also relieve the symptoms in patients with lower limbs arterial insufficiency(Buerger.,1986)

Benefits of Buerger's Allen exercise

The positive effects of Buerger's Allen exercise are indicative of improving blood flow, walking ability, reducing necrosis, reducing venous embolism, pain, swelling, cyanosis and the bed-rest times. It was recognized that they might increase the rate of blood flow, clear away stagnant blood and help establish collateral circulation to the ischemic area

Teaching a patient or his/her family about Buerger's exercises can prevent and treat diabetic foot problems, shortened any period of hospitalization, and delayed morbidity . Furthermore, several reports support the beneficial effects of Buerger's exercises in patients with diabetic foot problems . These effects are due to improving neuropathy, infection, pain, and arteriosclerosis with or without gangrene

Mechanism of Buerger's Allen exercise

The mechanism of Buerger's exercises use gravitational changes in positions that are applied to the smooth musculature of vessels and to the vascular . Gravity helps alternately to empty and fill blood columns, which can eventually increase transportation of blood through them . The exercises involve the individual lying flat in bed with the legs elevated at 45 degrees until blanching occurs or for a maximum of 2 minutes. The patient then sits on the edge of the bed with the feet hanging down. Further exercises include dorsiflex, plantarflex, then inward and outward movement of the feet, followed by flexing and extending of the toes. This second phase is maintained for a minimum of 2 minutes or until rubor has appeared. Finally, the individual lies supine with the feet covered with a warm blanket lasting 5 minutes. The whole cycle is repeated 3 to 6 times each session, and the complete sequence is repeated 2 - 4 times a day.

Section : IV

Studies related to Buerger's Allen exercise

Lowrence H. Wisham., 2010 conducted a quasi-experimental pre-post-test design study was undertaken to established a standardized procedure for Buerger Allen exercise combined with a health-promoting program and investigated its effectiveness in reducing peripheral neurovasculopathy among rural Taiwanese residents with type 2 diabetes who were at high risk of developing DFU. Peripheral neuropathy and vasculopathy are important risk factors for diabetic foot ulceration (DFU). The Buerger exercise protocol comprised of a 3-step posture change with 9 minutes for each cycle. Outcome measurements included the ankle brachial pressure index (ABI), Michigan neuropathy screening instrument (MNSI), blood pressure, frequency of selfreported leg discomfort, and a type 2 Diabetes Health Promotion Score. Thirty-one patients at high risk of developing DFU completed this study. The statistical significance using the t-test was achieved to be $P<0.05$ (value of tat 5% significance and 38 degrees of freedom for the mean was 2.02). Buerger exercise combined with a health-promoting program significantly improved (1) the ABI in both legs, (2) healthpromoting behaviors, (3) MNSI values, and (4) leg discomfort symptoms. The findings support the use of Berger exercises combined with a health-promoting program to improve symptoms of diabetic peripheral neuropathy and peripheral circulation.

A study to Systematic of Review Buerger Allen Exercise for Type 2 Diabetes Mellitus Foot Ulcer Patients was conducted by M.Vijayabarathi, and V.Hemavathi (2014) The study was aimed at evaluating the effectiveness of Buerger Allen exercise on wound healing process among Type2 Diabetic foot ulcer patients. Quasi experimental pre – test post – test control design was adopted and Non probability purposive sampling technique was used to select the samples. A total of 60 Type 2 diabetes mellitus patient with foot ulcer has been taken from Rajiv Gandhi Government General Hospital, Chennai, and the Buerger Allen exercise was practiced for the selected samples. Condition of the foot ulcer was analyzed before and after the study. Collected data was analyzed using descriptive and inferential statistics. A high significant On an average, in

experimental group, diabetic patients are having 24.6 % improved wound healing where as in control group, on an average, diabetic patients are having only 5.3 % wound healing

BalajiNujella.,2013 conducted a study to assess the effectiveness of compressive stockings withBuerger's Exercise provide the required pressure and thereby improve the circulation peripherally in PVD patients at Sangareddy, Andra Pradesh. The study was carried out between both the modalities to know the efficacy of one over the other. A sample of 40 individuals randomly divided into two groups, Group A and Group B, consisting 20 patients each (n=20), was involved in the study. At the end of study, statistical significance was achieved for compressive stockings over electrical stimulations in improving the maximal walking distance (MWD) in peripheral vascular disease patients. Inclusion and exclusion criteria along with the accepted clinical procedures were followed for methodology and tests for conducting the study. The MWD and the level of pain on Visual Analog Scale (VAS) were used as the objective and subjective outcome measures, respectively. The statistical significance using the t-test was achieved to be $P<0.05$ (value of tat 5% significance and 38 degrees of freedom for the mean was 2.021) for both the outcome measures after calculating their means and standard deviations.

A study to assess the effect of Buerger Allen Exercise on lower limbs skin perfusion pressure was conducted by Tota Kawasaki., 2013 The subjects of this study were 10 healthy adults and 11 patients with critical limb ischemia. Patients with critical limb ischemia, including both dorsum of foot and plantar of foot, having SPP of lower limbs of less than 40 mmHg (supine position) were the object of this study. SPP was measured on four positions (supine position, lower limbs elevation position, sitting position, and reclining bed elevation of 20° position). In sitting position, both the number of healthy adults and critical patients show significant increases in SPP compared with the other three positions. Findings were statistically significant differences in all groups $**p<0.01$, $*p<0.05$. These results suggest that sitting position is effective to keep good blood stream of lower limbs not only in healthy adults but also in patients with critical limb ischemia.

Sherin Hassan., 2012 conducted a study to compare between Allen-Burger exercises alone or combined with treadmill walking exercises on posterior tibial artery diameter, walking distance and economy. Sixty male patients suffering from intermittent claudication as a result of diabetic atherosclerosis participated in this study. Patients were randomly assigned into three groups; group (A) received AllenBurger exercises and treadmill walking exercises, group (B) received Allen-Burger exercises, and group (C) received medical treatment. Maximal walking distance and pain free walking distance, walking economy and posterior tibia artery diameter were measured pre and post the three months period for all groups. Findings of pain free walking distance group A&B mean difference 33.05 at p=0.0001, group A&C MD 172.15 at p=0.0001, group B&C MD 139.1 at p=0.0001. All measured parameters were improved in all groups with the greatest improvement been in group (A) and the least improvement in group (C) except for posterior tibial artery diameter that was improved in group (A) and (B).

Section : E

Studies related to effectiveness of Buerger Allen exercise on lower extremity perfusion.

Chang-Cheng Chang, MD, et al (2013) conducted a study to A quantitative real-time assessment of Buerger exercise on dorsal foot peripheral skin circulation in patients with diabetes foot. We recruited 30 patients with unilateral or bilateral diabetic ulcerated feet in Chang Gung Memorial Hospital, Chia-Yi Branch, from October 2012 to December 2013. Real-time dorsal foot skin perfusion pressures (spps) before and after Buergerexercise were measured and analyzed. In addition, the severity of ischemia and the presence of ulcers before exercise were also stratified. A total of 30 patients with a mean age of 63.4 ± 13.7 years old were enrolled in this study. Their mean duration of diabetes was 13.6 ± 8.2 years. Among them, 26 patients had unilateral and 4 patients had bilateral diabetes foot ulcers. Of the 34 wounded feet, 23 (68%) and 9 (27%) feet were classified as Wagner class II and III, respective. This study quantitatively demonstrates

the evidence of dorsal foot peripheral circulation improvement after Buerger exercise in patients with diabetes.

A study to assess the Effectiveness of Allen Buerger Exercise in preventing Peripheral Arterial disease in saveethauniversity,Chennai conducted by Thenmozhi., (2015) To determine the effectiveness of Allen Buerger Exercises among people with Type II Diabetes Mellitus by using Ankle –Brachial Index. Experimental Research Design with30 samples in experimental group and 30 samples in control group were selected by using random sampling technique . The findings of the study revealed that there is a significant improvement in Ankle-Brachial index Score in preventing peripheral arterial disease among people with Diabetes Mellitus in experimental group after receiving Allen Buerger exercise at the level of $P<0.05$ and there is s significant association between the duration of diabetes mellitus and the pretest score of ABI. Study participants got benefited by Allen Buerger exercise in preventing Peripheral Arterial Disease.

Aruna ., 2015 conducted a experimental study was to determine the effectiveness of Allen Buerger Exercises among people with Type II Diabetes Mellitus by using Ankle ±Brachial Index at Kuthambakkam village, Thiruvallur district of Tamil nadu, India. Diabetes mellitus increases the risk of lower extremity peripheral arterial disease by 2 to 4 times and is present in 12% to 20% of persons with lower extremity peripheral arterial disease. The risk of developing lower extremity peripheral arterial disease is proportional to the severity and duration of diabetes and 7- to 15-fold more likely to undergo a major amputation is also greater in diabetics than non diabetics. Experimental Research Design with 30 samples in experimental group and 30 samples in control group were selected by using random sampling technique. In experimental group there was a significant difference between the pre-test mean value 0.824 with SD 0.0652 and post test mean value 0.960 with SD .0508 which projects that t value 10.108*. Peripheral arterial disease and the effectiveness of Allen Buerger exercise was assessed by Ankle Brachial index Scale. The findings of the study revealed that there is a significant improvement in Ankle-Brachial index Score in preventing peripheral arterial disease among people with Diabetes Mellitus in experimental group after receiving Allen

Buerger exercise at the level of Peripheral Arterial Disease.

A study was undertaken to investigate the level of lower extremity perfusion among patient with type 2 diabetes and assess the effect of Buerger Allen Exercise to improve lower extremity perfusion among patients with type 2 Diabetes Mellitus admitted at Chettinad Hospital and Research Institute, Chennai, India was conducted by Jency John., 2015 . Non equivalent pre test post test control group design was followed to conduct the present study; divided 60 patients with type 2 diabetes mellitus were grouped in to two groups. Subjects in experimental group underwent intervention of buergerallen exercise under supervision for 2 times a day for 5 days and in control group, subjects were under regular treatment. Demographic data and ankle brachial index scale was used to assess the lower extremity blood circulation. In experimental and control group 24(80%), 15 (50%) had lower extremity arterial disease and 6(20%), 15 (50%) were in border line. In experimental group there was a significant difference between the pre-test mean value 0.922 with SD 0.0562 and post test mean value 0.980 with SD .0407 which projects that t value 9.108* was significant at the level of $p< 0.05$. The findings of the present study revealed that there is a significant improvement in the lower extremity perfusionafter doing Buerger Allen exercise.

MsTowershilshi et al (2014) conducted a study to assess the effectiveness of buergerallen exercise on level of lower extremity perfusion among patient with type2 diabetes mellitus. During clinical posting in the Saveetha Medical College Hospital Chennai, theinvestigator came across many patient with type II diabetes mellitus who is suffered from a peripheral artery disease due to inadequate lower extremity perfusion and in helpless situation due to lack of knowledge regarding management of peripheral artery disease. By this experience, the investigator felt that nurses has an important role in educating the patients regarding supervised exercise like Buerger's Allen Exercise. They used Quasi Experimental pre – test and post – test design. Non probability convenient sampling technique was used. A total of 60 admitted patients participated in the study. ABPI Scale was used to assess the level of lower extremity perfusion for data collection. Result was There is a significant improvement in the level of lower limb perfusion in experimental group after Buerger Allen exercise than the control group among patient with type 2 diabetes mellitus at ($p<0.001$).

CHAPTER – III

METHODOLOGY

Methodology refers to the techniques used to structure a study and to gather and analyze information in a systematic fashion. (Polit& Beck, 2013).

Research methodology is the way to systematically solve the research problem. Methodology occupies a key position as far as research documentation is concerned .It may be understood as a science of studying how research is done.It involves systematic procedure by which the researcher starts from the initial identification of the problem to its final conclusion.

This chapter deals with the research approach, research design, variables, setting, population, sample, sample size, and criteria for sample selection, sampling technique,description of the tool, data collection procedure,plan for data analysis and ethical consideration.

RESEARCH APPROACH

Research approach is a powerful design for testing hypotheses of casual relationship among variables. (polit,2011)

The researcher adopted quantitative research approach.

RESEARCH DESIGN

A research design is the determination and statement of the general research approach or strategy adopted for the particular project. It is the heart of planning. (David J.Luck,2012)

Quasi experimental with Pre test post test control group design was adopted in this study.The diagrammatic representation of this design is as follows

Study subject	**Pre-test**	**Intervention**	**Post test**
Experimental group	**O_1**	**X_1**	**O_2**
Control group	**O_1**		**O_2**

O_1 - Pretest assessment of the lower extremity perfusion level

O_2 - Posttest assessment of lower extremity perfusion level

X_1 - Intervention of Buerger Allen exercise

SETTING OF THE STUDY

Setting of the study is the physical location and condition in which data collection takes place in the study. (Polit,2011)

The study was conducted in Maria Diabetic centre and Morris Mathias hospital, Nagercoil. Maria Diabetic centre has 50 beds which is, 40 to 45 kms away from Thasiah College of nursing, Marthandam. The centre is well equipped with the latest technological advancements and automation and adhere to the various stringent internal and external quality control mechanism. There are 35 – 40 outpatients are every day and there are 20 beds for inpatients. It has physiotherapy department, operation theater for vascular surgery and wound debridement and Pathological laboratory.

Morris Mathias Hospital is a General Hospital it has 250 beds which is , 40 – 45 kms away from Thasiah college of nursing. Various specialities and treatments offered at Morris Mathias Hospital. The hospital is equipped with ENT, General Surgery, Gynecology & Obstetrics, Medical Care, Orthopedic Surgery, plastic surgery, intensive care unit, emergency department and dialysis unit ect. Each deprtment has 20 – 25 beds are available. The setting was chosen based on thefeasibility and availability of samples.

POPULATION

Population denotes the entire group of subjects under study (Sharma.k.2011).

The target population for the present study was patient with type 2 diabetes mellitus who wer admitted in Maria Diabetic centre and Morris Mathias hospitals.

SAMPLE

The sample is the subset of a population selected to participate in the research study. (Polit&Hungler2012).

The sample of the present study comprised of 60 Patients with type 2 Diabetes Mellitus admitted at Maria Diabetic centre and Morris Mathias hospitals.

SAMPLE SIZE

Sample size is the total number of sample participating in a study. (polit,2011)

The sample consists of 60 selected Diabetes mellitus patients with impaired lower extremity perfusion 30 for experimental group from Maria Diabetic centre and 30 for control group from Morris Mathias hospital , between the age group of 45-80years.

SAMPLING TECHNIQUE

The process of selecting a portion of the population to represent the entire population is known as sampling technique. (Patricia2012

Non-probability purposive sampling technique was used to select the samples for the present study

CRITERIA FOR SAMPLE COLLECTION

The samples was selected based on the following criteria.

Inclusion criteria

Patients with

- Age group of 45 – 80 years
- Ankle BrachialIndex score less than 0.9
- Chronic diabetes mellitus with foot ulcer and gangrene
- Both maleandfemale.

Exclusion criteria

Patient who are

- Critically ill.
- Disoriented
- On anticoagulant therapy
- Not willing to participate

VARIABLES

Research variablesare the qualities, properties, or characteristicsidentified in the research purpose and objectives or questions thatare observed or measured in the study (Susank.Grove, 2012)

Independent variable :Buergerallen exercise

Dependent variable : Lower extremity perfusion

DESCRIPTION OF TOOL

Tools are divided in two sections. Based on the objectives of the study modified standardized tool was used to assess the lower extremity perfusion level.

Section A) : Demographic profile:

This section consist of age, sex, marital status, religion, education, dietary pattern, type of job, duration of diabetes mellitus, associated illness, family history of peripheralarterydisease.

Section B): Clinical variables:

The section deals with clinical variables such as

Part-I:Assessment of Peripheral arterial diseaseusingAnkle Brachial Index Scale.

Assessment of Peripheral arterial disease using Ankle Brachial Index Scale is done by standard manual sphygmomanometer where the score is interpreted

ABI index

0 = Normal (>0.90)

1 = Mild PDA (<0.89 - >0.60)

2 = Moderate PAD (<0.59 - >0.40)

3 =Severe PAD (<0.39

Part – 2 : Level of lower extremity perfusion assessed by Modified Inlow's 60-second diabetic foot assessment scale

It involves the assessment level of lower extremity perfusion

Score 0 – 3 Adequate perfusion

Score 4 – 8 Moderately Adequate perfusion

Score 9 – 13 Inadequate perfusion

Score 14 – 18 Severely inadequate perfusion

DESCRIPTION OF INTERVENTION

Buerger Allen Exercise is one of the intervention to stimulate the development of collateral circulation in the legs. In this exercise there are three steps.

Step 1 Elevation

The lower extremities are elevated to 45 degree angle and supported with pillow in this position until the skin blanches (3 minutes).

Step 2 Dependency

The feet and legs are then lowered below the level of the rest of the body until redness appears (10 minutes).

Step 3 Horizontal

The legs are placed flat on the bed for 7 minutes. The Buerger Allen Exercise is given to the patients three times per day with 3 hours interval for the period of 5 days.

The Post test was done to the same group (Modified 60-second diabetic foot assessment scale) on the Sixth day.

CONTENT VALIDITY

The Content validity of the tool was established on the basis of the opinion of 5 experts. 2 consultants from Medical surgical department, 2 professors from Medical surgical nursing department and 1 physiotherapist. The necessary suggestions and modification were in corporated in the final preparation of the tool.

RELIABILITY

The reliability was done by the Test-Retest method. The reliabilityof the score is 0.9. Hence, the tool was considered reliable for proceeding with the study.

PILOT STUDY

Pilot study is defined as, "a small-scale version or trial run, done in preparation of a major study''. Denise F. Polit(2011)

The pilot study was done after obtaining formal permission from the Principaland the ethical committee of Thasiah college of nursing. The pilot study was conductedat Morris Mathias hospital, Nagercoil and Vinoth hospital, Marthandam. after obtaining formal permission from the director of the hospital. Pilot study was conducted in the month of February for a period of one week. The researcher introduced herself to the study subjects and established good rapport. The sample were selected using the purposive sampling technique. Based on inclusion criteria 6 samples were selected.3 samples from Morris Mathias hospital, Nagercoil were allotted for experimental group and 3 samples from Vinoth hospital, Marthandam were allotted for control group. The Buerger Allen Exercise is given to the patients three times per day with 3 hours interval for the period of 5 days.The Post test was done to the same group (Modified 60-second diabetic foot assessment scale) on the Sixth day. The researcher showed that the tool was reliable. The researcher has not found any practical difficulties during the study. It revealed that the study was feasible.

DEVELOPMENT OF INTERVENTION

The intervention package was developed by the investigator after reviewing the literature and by obtaining the experts opinion. Buergerallen exercise includes the following.

- General instruction
- Preparation
- Buerger Allen Exercise
- After care

Step 1 – General instruction

- Establishing and maintaining a trustworthy relationship
- Self introduction about the importance of lower extremity perfusion and benefits of Buergerallen exercise.

Step 2 – Preparation

- Explaining the procedure to the patient
- Providing comfortable bed

Step 3 – Buerger allen exercises

- Buergerallen exercises intended to improve circulation to the feet and legs.
- The lower extremities are elevated to a 45 to 90 degree angle and supported in this position until the skin blanches.
- The feet and legs are then lowered below the level of the rest of the body until redness appears (care should be taken that there is no pressure against the back of the knees);
- Finally, the legs are placed flat on the bed for a few minutes.
- The procedure was given three times per day with 3 hours interval for the period of 5 days.

Step 4 – After care

- Once finished check the pedal pulse
- Find out any discoloration in lower extremity.
- Document in nurses record.

DATA COLLECTION PROCEDURE

The researcher obtained permission from the hospital and obtain the informed consent from study group(Maria diabetic centre and Morris Mathias hospital) for conducting the study. The investigator was given proper information regarding Buerger allen exercise for impaired lower extremity perfusion patients between the age group of 45-80 years. In the study pain, swelling, varicose vein and cyanosis in lower extremity was taken as a sample by using purposive sampling technique.

The researcher has taken 60 samples, among them 30 patients for experimental group in Maria diabetic centre and 30 patients for control group in Morris Mathias hospital. pre test was conducted for both group by modified 60-second diabetic foot assessment scale. it includes three steps of buergerallen exercise was given for 20 minutes three times per day with 3 hours interval for the period of 5 days.

The Post test was done to the same group (Modified 60-second diabetic foot assessment scale) on the Sixth day. This exercise is to improve lower extremity perfusion ,reduce pain and swelling. The data was collected from ward and post test was conducted on sixth day of intervention by checking improvement of lower extremity perfusion with the Modified Inlow's 60- second diabetic foot assessment scale. All samples were cooperative during the data collection procedure.

PLAN FOR DATA ANALYSIS

Descriptive and inferential statistical techniques such as frequency distribution, inferential statistical analysis (mean, median, mode), standard deviation, chi square and't' test was used for data analysis and data was present in the form of tables, graphs and diagrams.

DESCRIPTIVE STATISTICS

- Frequency and percentage distribution used to analyze the selected demographic variable
- Mean and standard deviation is used to assess the level of lower extremity perfusion

INFERENTIAL STATISTICS

- Paired 't'test was used to assess the effectiveness of Buerger Allen exercise on level of lower extremity perfusion.
- Chi square test was used to find out the association of post test scores of lower extremity perfusion with their selected demographic variables.

ETHICAL CONSIDERATION

- Permission was obtained from the ethical committee.

- Permission was obtained from the authority of medical centre.
- Patients were protected from harm.
- Confidentiality was maintained.

Research Design

Pre test-post test control group design

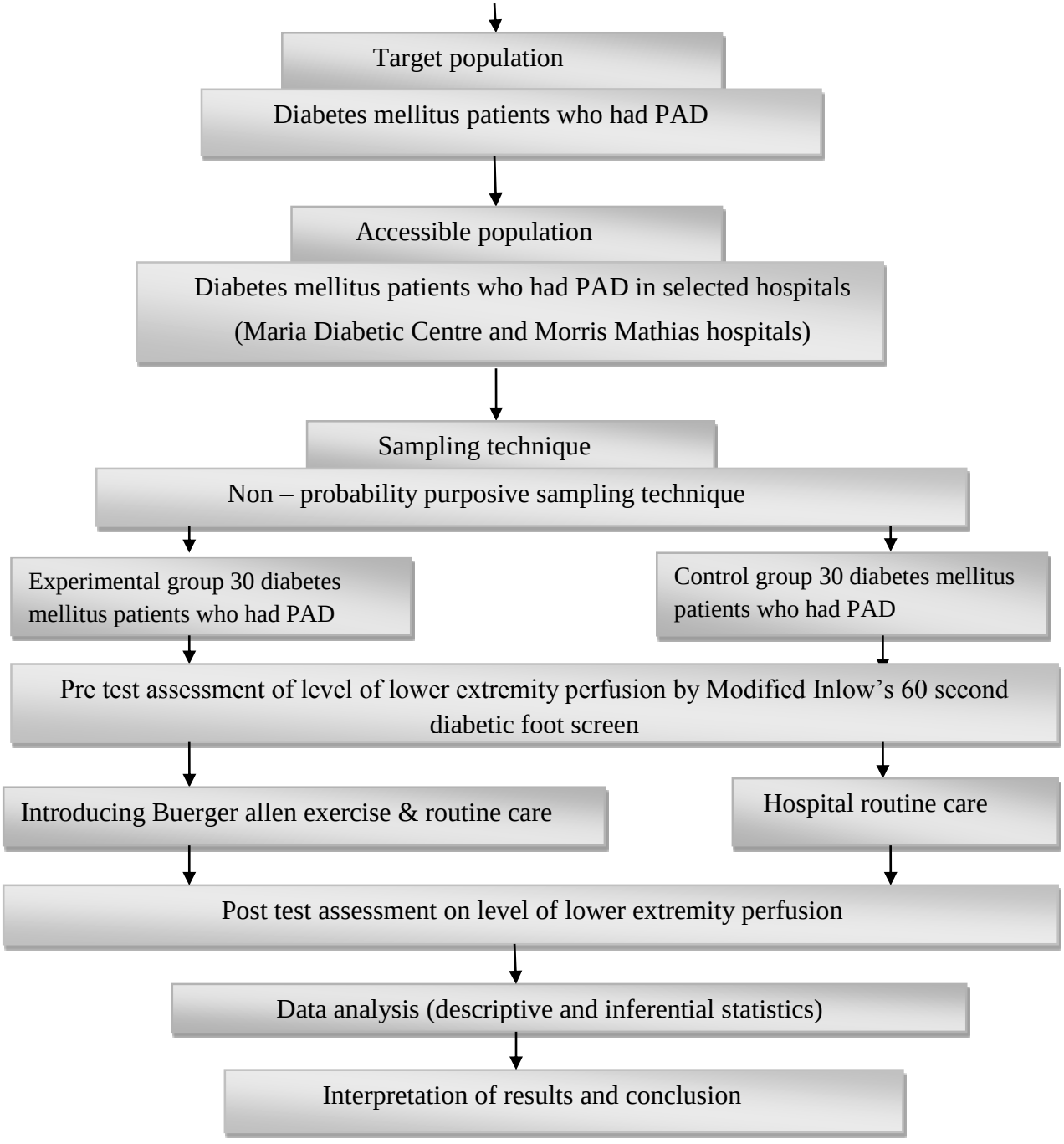

FIGURE: 2 SCHEMATIC REPRESENTATION OF RESEARCH METHODOLOGY

CHAPTER IV

DATA ANALYSIS AND INTERPRETATION

Statistical analysis is a method of rendering qualitative information meaningful and intelligible, statistical procedure enables the researcher to reduce, summarize, organize, evaluate, interpret and communicate numeric information.

This chapter presents the analysis and interpretation of data, collected from in order to determine their level of lower extremity and effectiveness of Buerger Allen exercise. The data collected were organized, tabulated, analyzed and interpreted by means of statistical table and figures.

Description and inferential statistics were used for analyzing the data on the basis of objectives of the study.

PRESENTATION OF DATA

Section I :Frequency and percentage distribution of the level of lower extremity perfusion among patients with diabetes mellitus according to the demographic variables in experimental and control group.

Frequency and percentage distribution of the level of lower extremity perfusion among patients with diabetes mellitus according to the clinical variables in experimental and control group.

Section II : Distribution of pre test level of lower extremity perfusion among patients with diabetes mellitus in experimental and control group.

Distribution of post test level of lower extremity perfusion among patients with diabetes mellitus in experimental and control group

Section III: Comparison of pre test and post test level of lower extremity perfusion among patients with diabetes mellitus in experimental and control group

Comparison of post test level of lower extremity perfusion among patients with diabetes mellitus in experimental and control group

Section IV : Association of post test level of lower extremity perfusion among patients with diabetes mellitus in experimental and control group with their selected demographic variables and clinical variable

SECTION I

TABLE 1

Frequency and percentage distribution of the level of lower extremity perfusion among patients with diabetes mellitus according to the demographic variables in experimental and control group. N = 60

S.No	**Demographicvariables**	**Experimental group**		**Control group**	
		f	%	**f**	%
1.	**Age**	0	0	0	0
	40-55 years	22	73.3	20	66.7
	56-70 years	8	26.7	10	33.7
	71-85 years				
2	**Gender**				
	Male	16	53.3	17	56.7
	Female	14	46.7	13	43.3
3	**Marital Status**				
	Married	30	100	30	100
	Unmarried	0	0	0	0
4	**Religion**				
	Hindu	14	46.7	15	50
	Christian	14	46.7	13	43.3
	Muslim	2	6.6	2	6.7
5	**Education**				
	No formal Education	10	33.3	9	30
	Middle school	9	30.0	10	33.3
	Higher Secondary	9	30	10	33.3
	Graduate	2	6.7	1	3.3
6	**Dietry Pattern**				
	Vegetarian	4	13.3	3	10
	Non vegetarian	26	86.7	27	90
7	**Type of job**				
	Sedentry	6	20	6	20
	Moderate work	3	10	2	6.7
	Heavy work	7	23.3	7	23.3
	Not working	14	46.7	15	50

Table 1 depicts that most of the patients in experimental group, 22(73.3%) were between the age group of 56 – 70 years and 8(26.7%)were between the age group of 71 -85years . In control group most of the patients 20(66.7%) were between the age group of 56 – 70 years, and 10(33.3%)were between the age 71 -85 years.

According to sex majority of the patients in experimental group 16(53.3%) were maleand 14(46.7%) were female. In control group 17(56.7%) were male and 13(43.3%) were female.

Regarding marital status in both experimental and control group all are married.

According to religion in experimental group 14(46.7%) were hindu, and 14(46%) were christians, In control group most of the patients 15(50%) were hindu, 13(43.3%) were christians, and2(6.67%) of them muslim in both group.

Regarding the educational level in experimental group nearly 10(33.3%) patients were of no formal education, 9(30%) were studied in middle school, , 9(30%) studied in higher secondary and 2(6.7%) were Graduate. Same as in control group nearly 9(30%) patients were of no formal eduction, 10(33%) were studied middle school, 10(33.3%) studied higher secondary and only one Graduate.

Related to the dietary pattern in experimental group 4(13.3%) patients were vegetarian, and majority of the patients 26(86.7%)were non vegetarian. Same as in control group 3(10.00) patients were vegetarian, and majority of the patients 27(90%) of them non vegetarian.

Considering the type of job, in both experimental and control group, nearlyhalf of them 15(50%) not working 6(20%) were sedentary workers, 2(6.7%) Moderate workers, and 7(23.3%) belongs to both heavy workers.

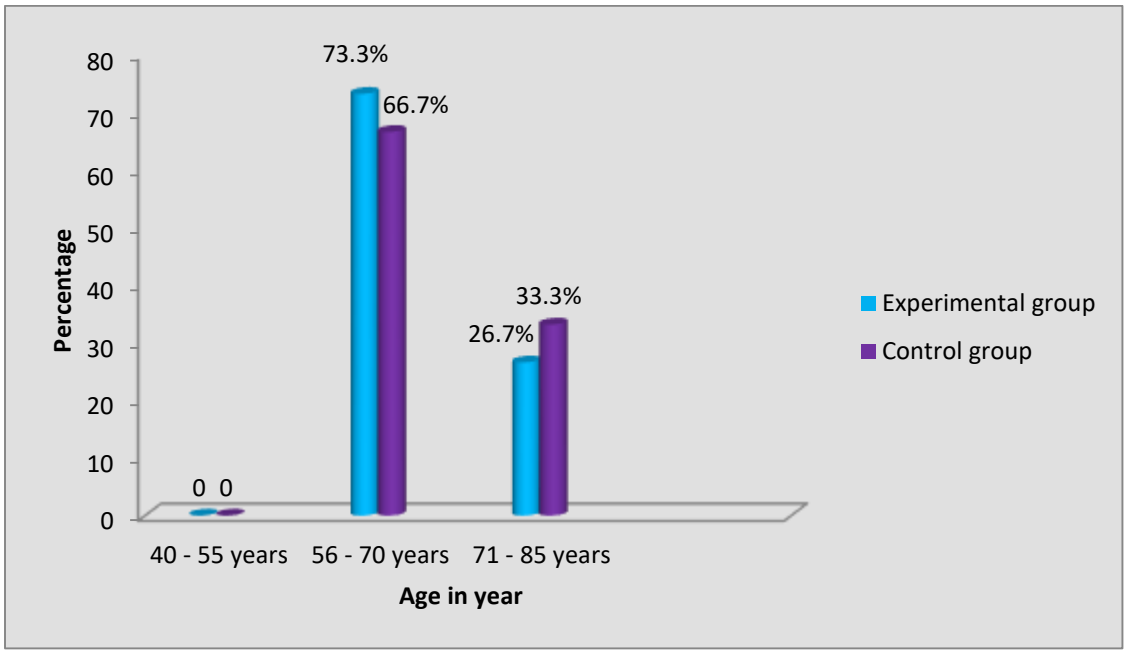

Figure 1 Percentage distribution of level of lower extremity perfusion among patients with diabetes mellitus according to their age in experimental and control group.

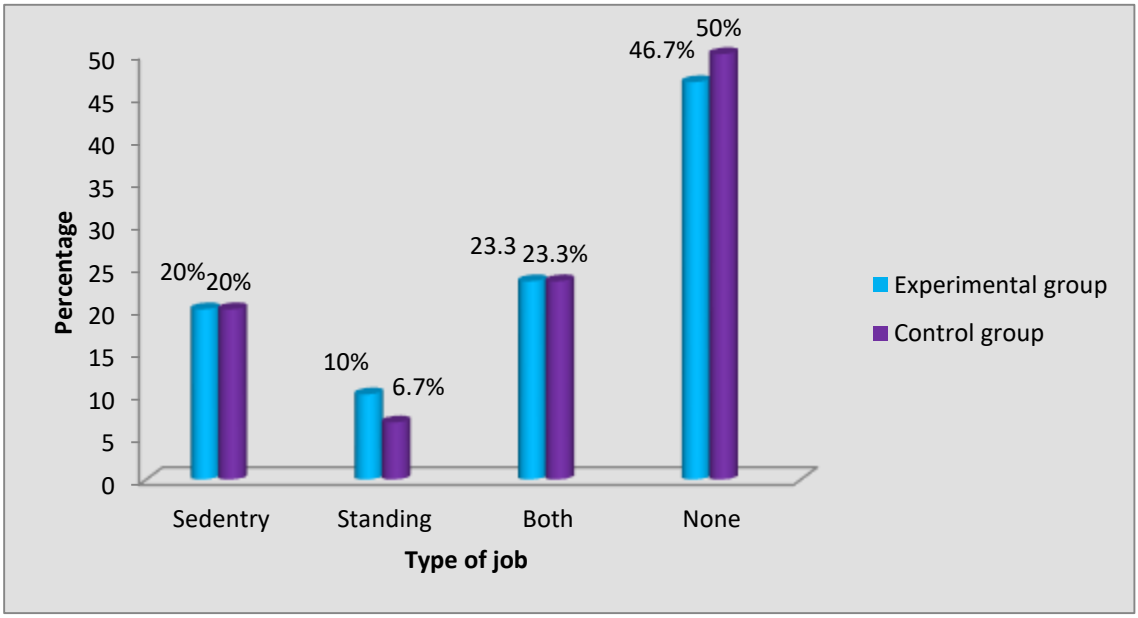

Figure 2 Percentage distribution of level of lower extremity perfusion among patients with diabetes mellitus according to their Type of job in experimental and control group

Table 2

Frequency and percentage distribution of the level of lower extremity perfusion among patients with diabetes mellitus according to the clinical variables in experimental and control group. **N =60**

SN	Clinical variables	Experimental group		Control group	
		f	%	f	%
1.	**Duration of DM**				
	Less than 5 years	0	0	0	0
	6 – 10 years	12	40	13	43.3
	More than 10 years	18	60	17	56.7
2	**Associated Illness**				
	Hypertention	15	50	17	56.7
	Renal problem	6	30	8	26.7
	Cardiac problem	9	20	5	16.7
3.	**Family history of PAD**				
	Yes	9	30	8	26.7
	N0	21	70	22	73.3

The above table 2 depict that the duration of DM in experimentl group 12(40%) patients were diagnosed 6 – 10 years duration and 18(60%)were more than 10 years duration.In control group13(43.3%) patients were diagnosed 6 – 10 years duration and 17(60%)were more than 10 yearsduration.

Considering associated illness most of the patient in experimental group 15(50%)werehaving hypertension,9(30%) patients were with renal problem, and 6(20%) patients with cardiacproblem. In control group majority of the patients 17(56.7%) werehaving hypertension,8(26.7%) were with renal problem, and 5(16.7%) were with cardiac problem.

.Regarding family history of PAD in experimental group 9(30%) of them hadthe history of PAD and 21(70%) of them, there is no history of PAD. In control group 8(26.7%) of them had the history of PAD and 22(73.3%) of them, there is no history of PAD.

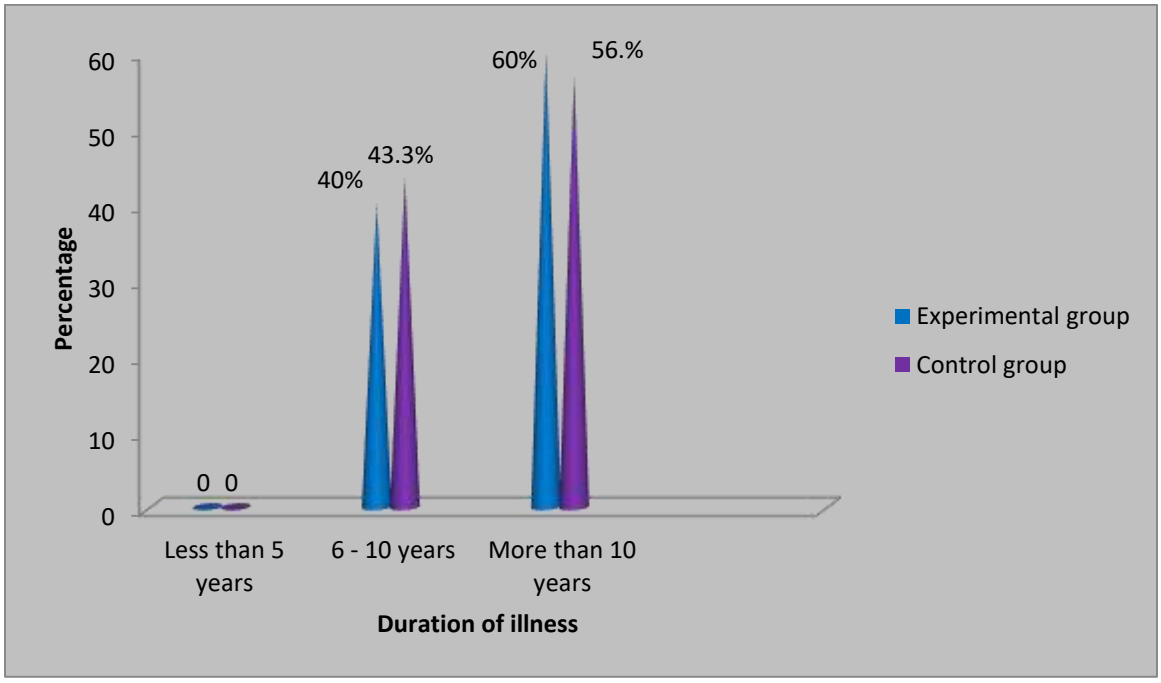

Figure 3: Percentage distribution of level of lower extremity perfusion among patients with diabetes mellitus according to their duration of DM in experimentaland control group

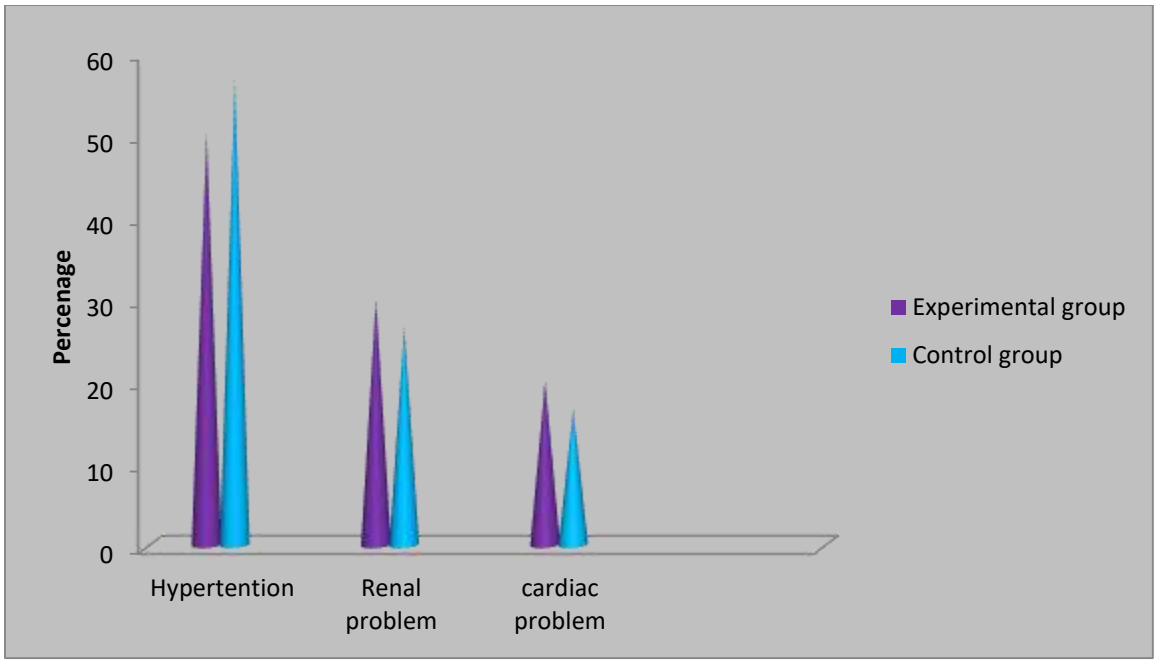

Figure 4: Percentage distribution of level of lower extremity perfusion among patients with diabetes mellitus according to their associated illness in experimental and control group

SECTION II

TABLE 3

Frequency and percentage distribution of pre test and post test level of lower extremity perfusion in Right leg among patients with diabetes mellitus in both experimentl and control group. n = 60

Level of perfusion	**Pre test**				**Post test**			
	Experimental Group		Control group		Experimental Group		Control group	
	f	%	f	%	F	%	F	%
Adequateperfusion	0	0	0	0	13	43.3	0	0
Moderatelyadequate	0	0	0	0	17	56.7	0	0
Inadequate	14	46.7	15	50	0	0	15	50
Severely Inadequate	16	54.3	15	50	0	0	15	50

Table 3 describes that before the intervention of Buerger Allen Exercise in experimental group 14(46.7%) patients had Inadequate perfusion, 16(54.3%) had severely inadequate perfusion and none of them hadadequateandmoderatelyadequate perfusion. After the Buerger Allen Exercise 13(43.3%) patients had adequate level of lower extremity perfusion, 17(56.7%) had moderately adequate perfusion and none of them had inadequate and severely inadequate perfusion.

In the control group 15(50%) patients had severely inadequate perfusion, 15(50%) hadinadequate perfusion, and none of them had moderate and adequate perfusion in pre test. And there was no change in post test

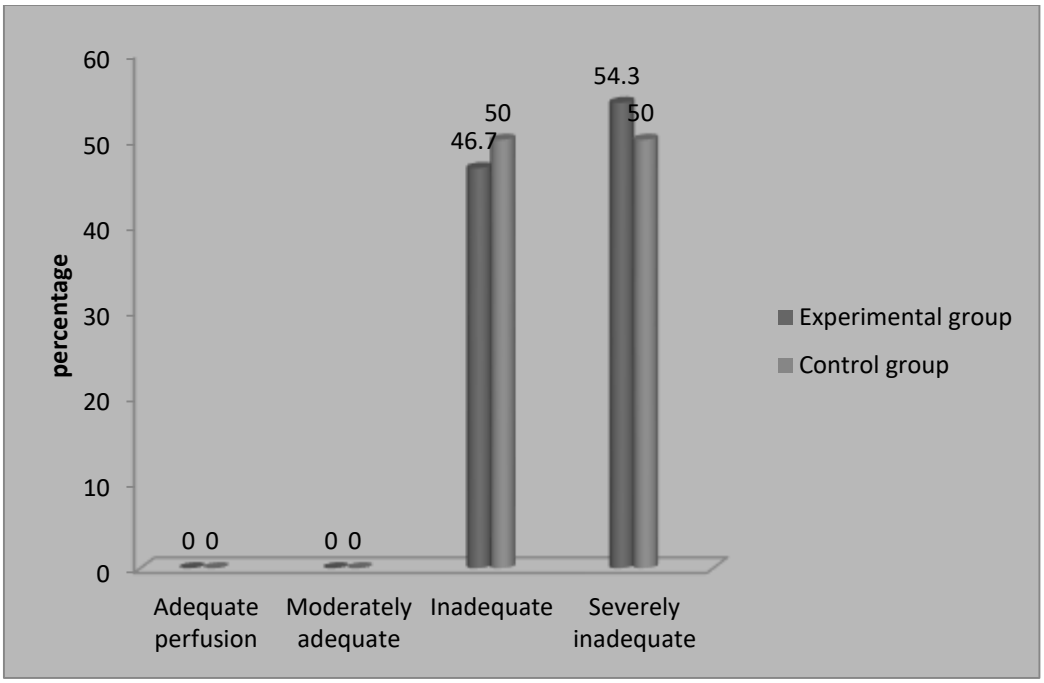

Figure 5: Percentage distribution of pre test level of lower extremity perfusion in Right leg among patients with diabetes mellitus in both experimental and control group.

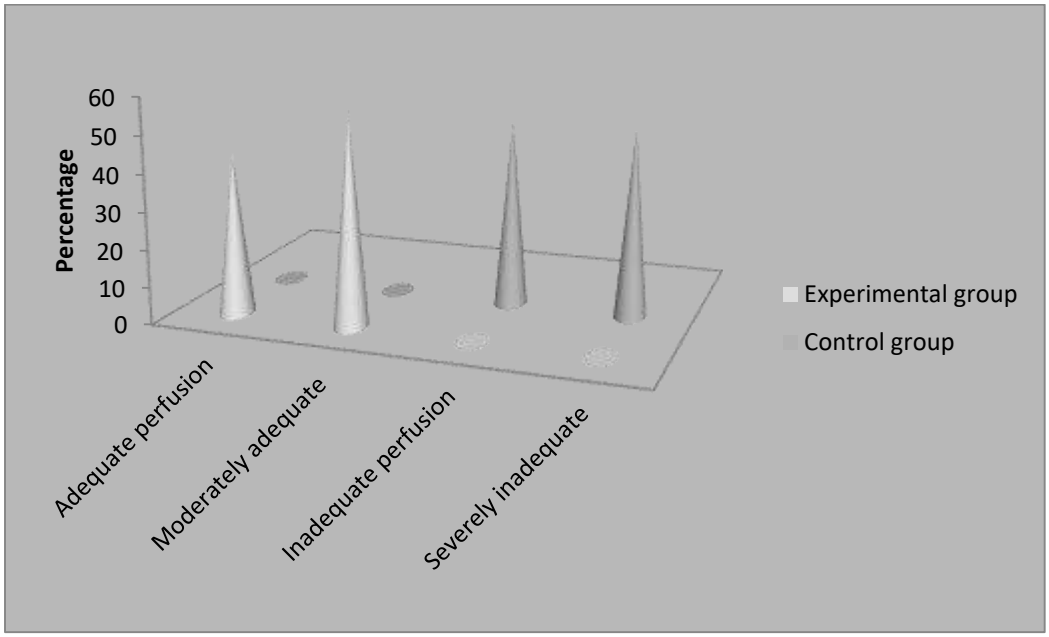

Figure 6: Percentage distribution of post test level of lower extremity perfusion in Right leg among patients with diabetes mellitus in both experimental and control group.

TABLE 4

Frequency and percentage distribution of pre testand post test level of lower extremity perfusion in Left leg among patients with diabetes mellitus in both experimental and control group. n= 60

Level of perfusion	**Pre test**				**Post test**			
	Experimental Group		Control group		Experimental Group		Control group	
	f	%	F	%	f	%	f	%
Adequateperfusion	0	0	0	0	14	46.7	0	0
Moderatelyadequate	0	0	0	0	16	53.3	0	0
Inadequate	15	50	15	50	0	0	15	50
SeverelInadequate	15	50	15	50	0	0	15	50

Table 4 describes that before the intervention of Buerger Allen Exercise in experimental group 15(50%) patients had Inadequate perfusion, 15(50%) had severely inadequate perfusion and none of them had adequate and moderately adequate perfusion. After the Buerger Allen Exercise 14(46.7%) patients had adequate level of lower extremity perfusion, 16(53.3%) had a moderately adequate perfusion and none of them had Inadequate and severely inadequate perfusion.

In the control group 15(50%) patients had severely inadequate perfusion, 15(50%) had inadequate perfusion, and none of them had moderate and adequate perfusion in pre test. And there was no change in post test.

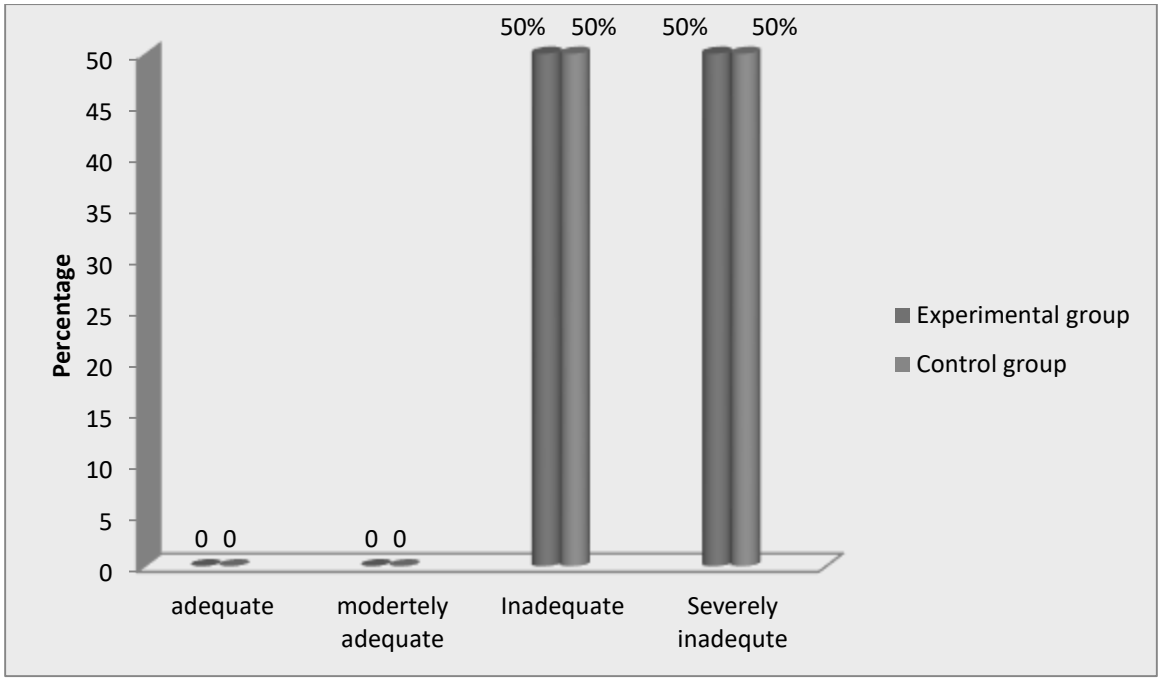

Figure 7: Percentage distribution of pre test level of lower extremity perfusion in Left leg among patients with diabetes mellitus both experimental and control group.

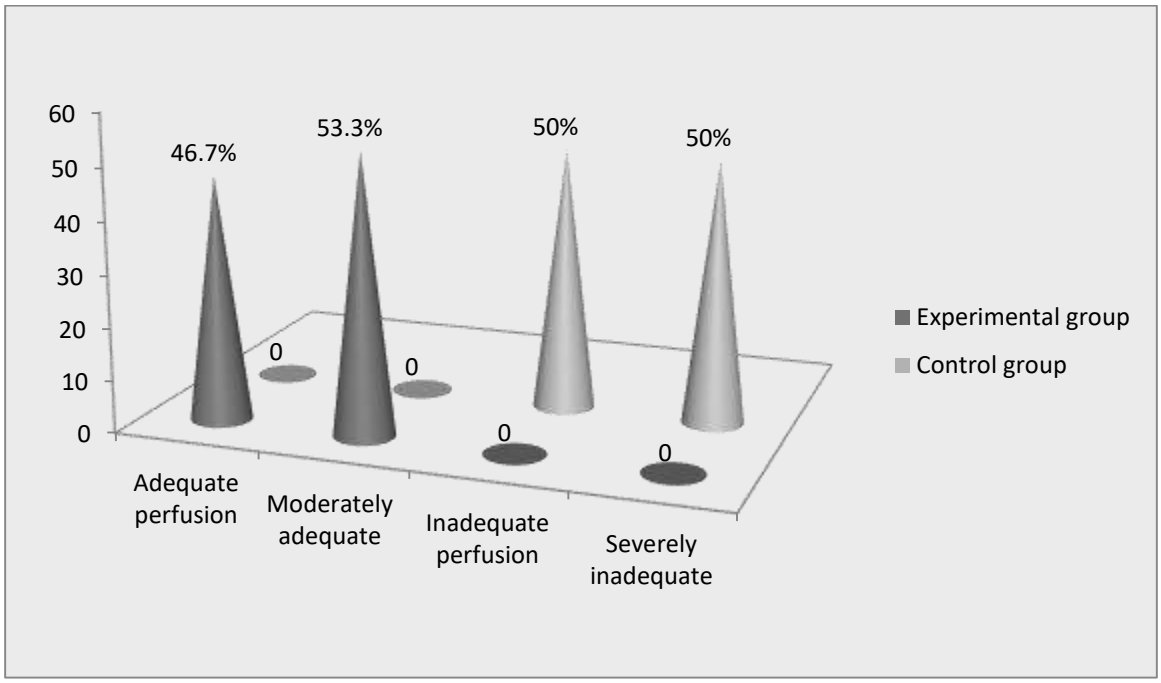

Figure 8: Percentagedistribution of post test level of lower extremity perfusion in Left leg among patient with diabetes mellitus in both experimental and control group.

SECTION III

TABLE 5

Comparision of pre test and post test level of lower extremity perfusion score in Right leg among patients with diabetes mellitus both experimental and control group.

Group	Test	Mean	SD	Mean difference	Paired 't' test	'P' Value
Experimental	Pretest	13.06	1.71	8.13	32.43	0.001*
Group	Post test	4.93	2.01			
Control	Pre test	12.76	2.68			
Group	Post test	12.66	1.70	0.10	0.18	0.857#

*Significantat 0.05 level

Notsignificant

To Compare the pre test and post test level of lower extremity perfusion score in Right leg amongpatients with diabetes mellitus in both experimental and control group.the null hypothesis was started as follow:

$H0_1$;The mean post test score of lower extremity perfusion will not be significantly lower than the mean pre test score of lower extremity perfusion in experimental group who had Buerger allen exercise.

The hypothesis was tested using paired 't' test method.

Table 5 summerizes that the mean post test perfusion score in experimental group was4.93 which was less than mean pre test perfusion score 13.06. The obtained paired 't'value is 32.43 was highly significant at 0.001.The mean difference 8.13 is a true difference has not occurred by chance

The above finding fails to support the null hypothesis. Hence the researcher reject the null hypothesis.and accept the research hypothesis. This proves that due to the effect

of Buerger allen exercise the mean post test perfusion score in type 2 Diabetes mellitus patients who has peripheral arterial disease in experimental group had marked reduction.

In control group the mean post test perfusion score 12.66and the pre test perfusion score 12.76. The mean difference 0.10was low and statistically not significant at 0.05.

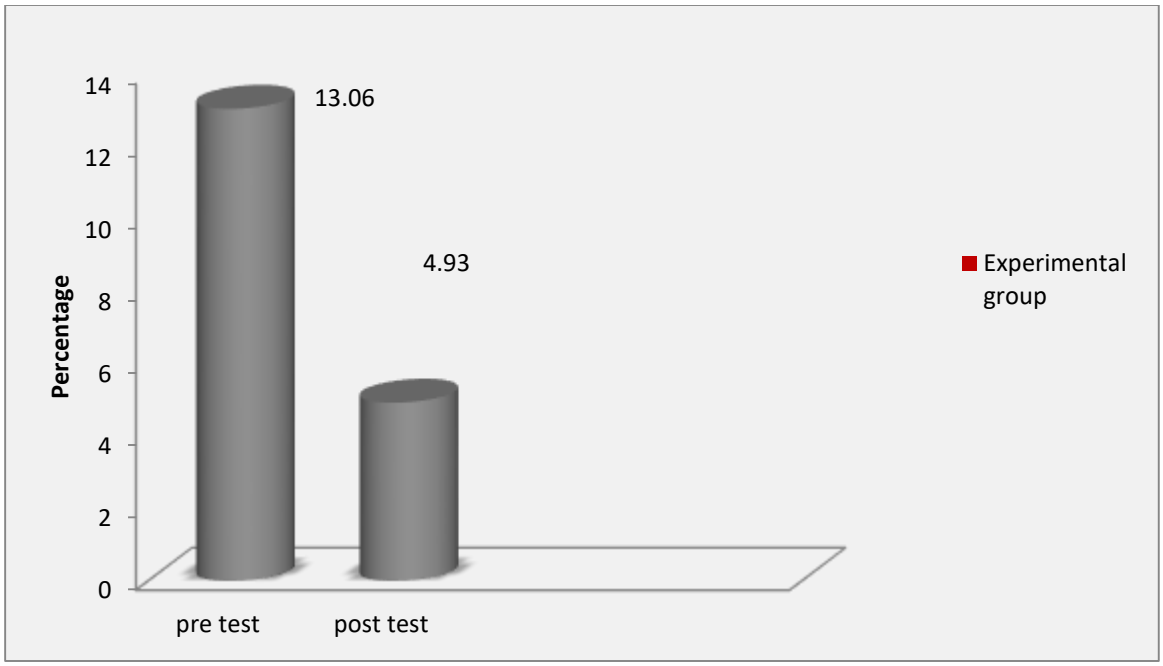

Figure 9: Comparision of pre testandpost test level of lower extremity perfusion score in Right leg among patients with diabetes mellitus in experimental group

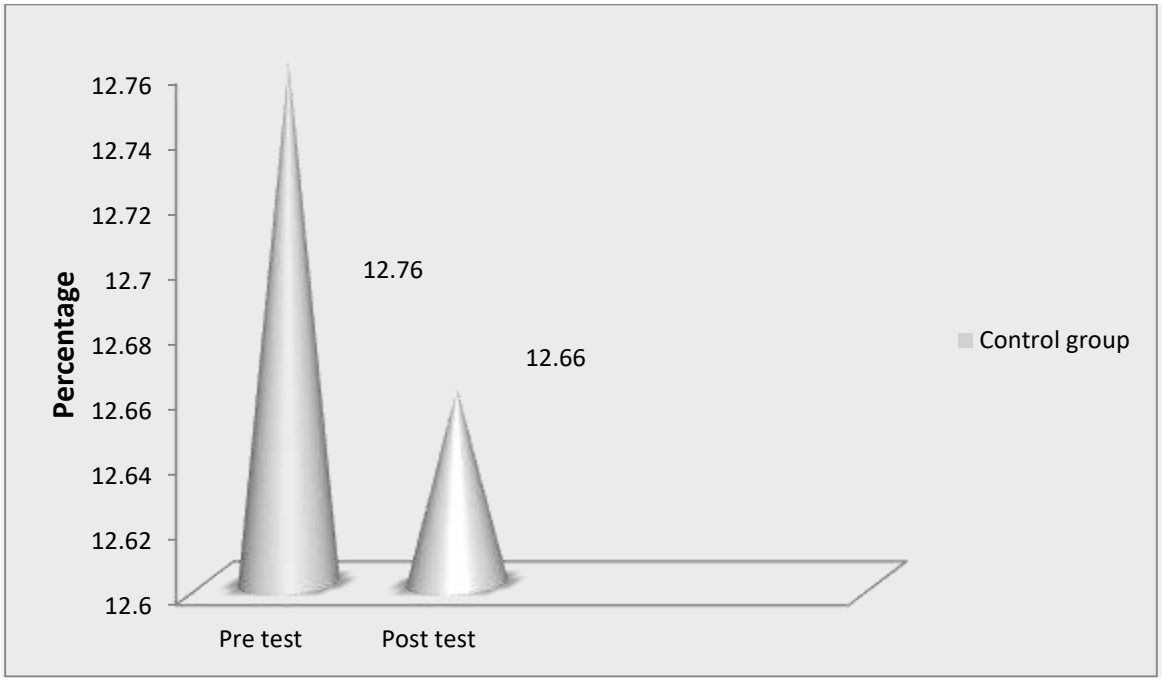

Figure 10: Comparision of pre test and post test level of lower extremity perfusion score in Right leg among patients with diabetes mellitus in Control group group

TABLE 6

Comparision of pre test and post test level of lower extremity perfusion score in Left leg among patient with diabetes mellitus both experimental and control group.

Group	Test	Mean	SD	Mean difference	Paired 't' test	'P'Value
Experimental Group	Pretest	12.90	1.84	7.70	29.24	0.001*
	Post test	5.20	2.21			
Control Group	Pre test	13.06	1.74	0.20	1.06	0.432#
	Post test	12.86	1.70			

*Significant at 0.05 level

Not significant

To Compare the pre test and post test level of lower extremity perfusion score in Left leg among patients with diabetes mellitus both experimental and control group.the null hypothesis was started as follows:

$H0_1$; The mean post test score of lower extremity perfusion will not be significantly lower than the mean pre test score of lower extremity perfusion in experimental group who had exercise

The hypothesis was tested using paired 't' test method.

Table 6 summerizes that the mean post test perfusion score in experimental group was5.20 which was less than mean pre test perfusion score 12.90. The obtained paired

‘t’value is 29.24 was highly significantat 0.001. The mean difference 7.70 was a true difference has not occurred by chance

The above finding fails to support the null hypothesis. Hence the researcher reject the null hypothesis and accept the research hypothesis. This proves that due to the effect of Buerger allen exercise the mean post test perfusion score in type 2 Diabetes mellitus patients who has peripheral arterial disease in experimental group had marked reduction.

In control group the mean post test perfusion score 12.86 and the pre test perfusion score 12.9. The mean difference 0.20 was low and statistically not significant at 0.05.

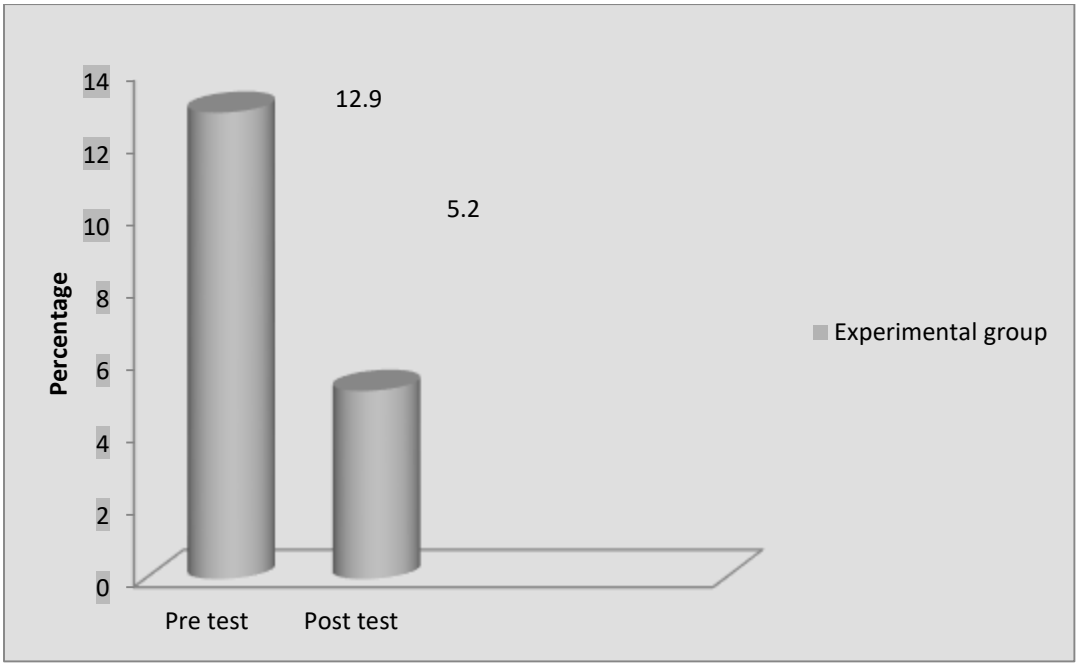

Figure 11: Comparision of pre test and post test level of lower extremity perfusion score in Left leg among patients with diabetes mellitus in experimental group

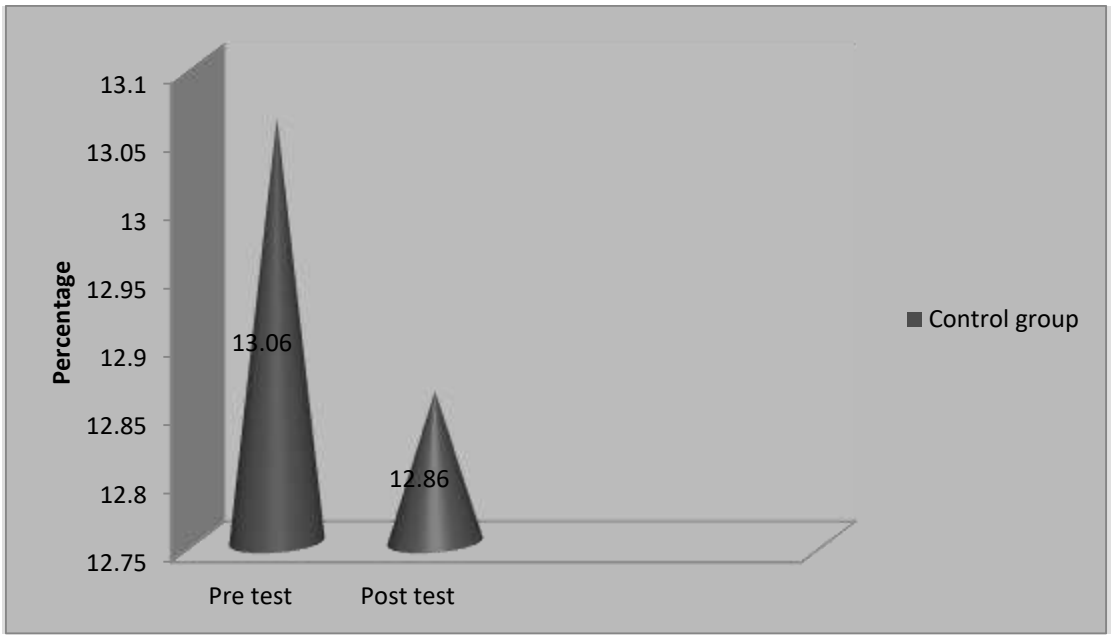

Figure 12: Comparision of pre test and post test level of lower extremity perfusion score in Left leg among patients with diabetes mellitus in Control group

TABLE 7

Comparision of post test level of lower extremity perfusion score in Right leg among patient with diabetes mellitus in experimental and control group

Group	Mean	SD	Mean Differences	't' test	Level of significance
Experimental group	4.93	2.01	7.73	16.17	0.001*
Control group	12.66	1.70			

*Significant at 0.05 level

To Compare the post test level of lower extremity perfusion score in Right leg among patient with diabetes mellitus both experimental and control group. the null hypothesis was started as follow,

$H0_2$; The meanpost test levels of lower extremity perfusion among patients with type2 diabetes mellitus in experimental group will be lower than themean post test levels of lower extremity perfusion in control group.

The hypothesis was tested using 't' test method.

Table 8 depicts that in the experimental group the mean post test perfusion score 4.93 were lesser than the post test perfuision score of control group 12.66. The obtained 't'value for level of perfusion on 16.17 were statistically significant at 0.001. This indicates the mean difference of 7.73 are true difference and has not occurred by chance. The above findings fail to support the null hypothesis. Hence the researcher rejects the null hypothesis and accept the research hypothesis.

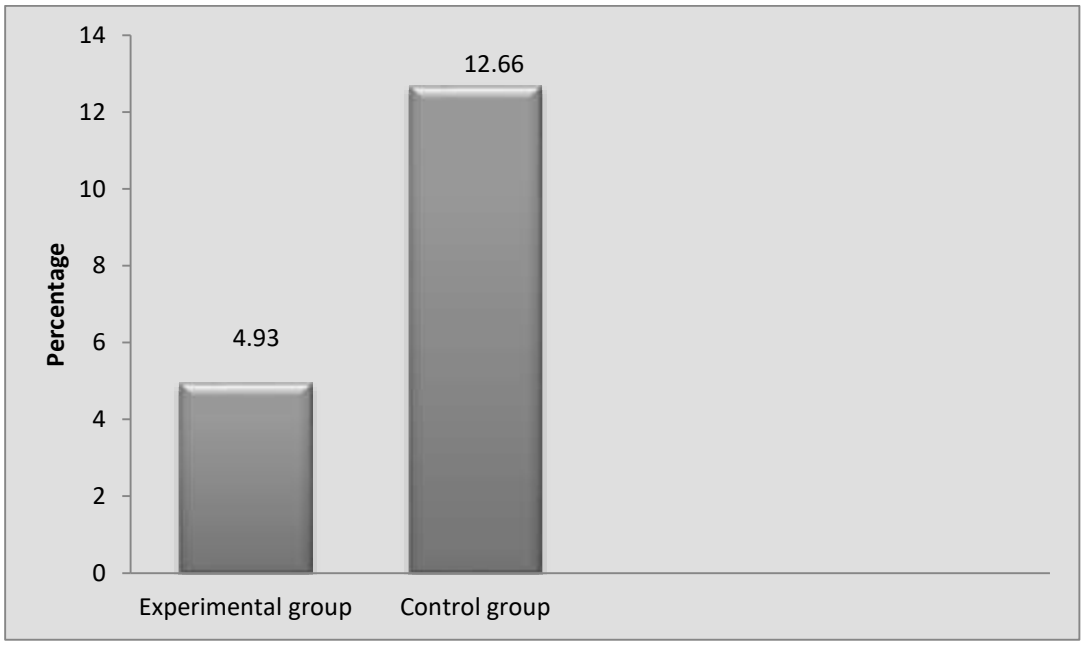

Figure 13Comparsion of post test level of lower extremity perfusion score in Right leg among patient with diabetes mellitus in experimental and control group.

TABLE 8

Comparisionof post test level of lower extremity perfusion score in Left leg among patient with diabetes mellitus in experimental and control group

Group	Mean	SD	Mean Differences	't' test	'p' Value
Experimental group	5.20	2.22	7.66	15.19	0.001*
Control Group	12.86	1.70			

*Significantat 0.05 level

To Compare the post test level of lower extremity perfusion score in Left leg amongpatient with diabetes mellitus both experimental and control group. the null hypothesis was started as follow,

$H0_2$; The mean post test levels of lower extremity perfusion among patients with type2 diabetes mellitus in experimental group will be lower than the mean post test levels of lower extremity perfusion in control group.

The hypothesis was tested using 't' test method.

Table 8 depicts that in the experimental group the mean post test left leg perfusion score 5.20 were lesser thanthe post test perfuision score of control group 12.86. The obtained 't'value for level of perfusion on 15.19 were statistically significant at 0.001. This indicates the mean difference of 7.66are true difference and has not occurred by chance. The above findings fail to support the null hypothesis. Hence the researcher rejects the null hypothesis and accept the research hypothesis.

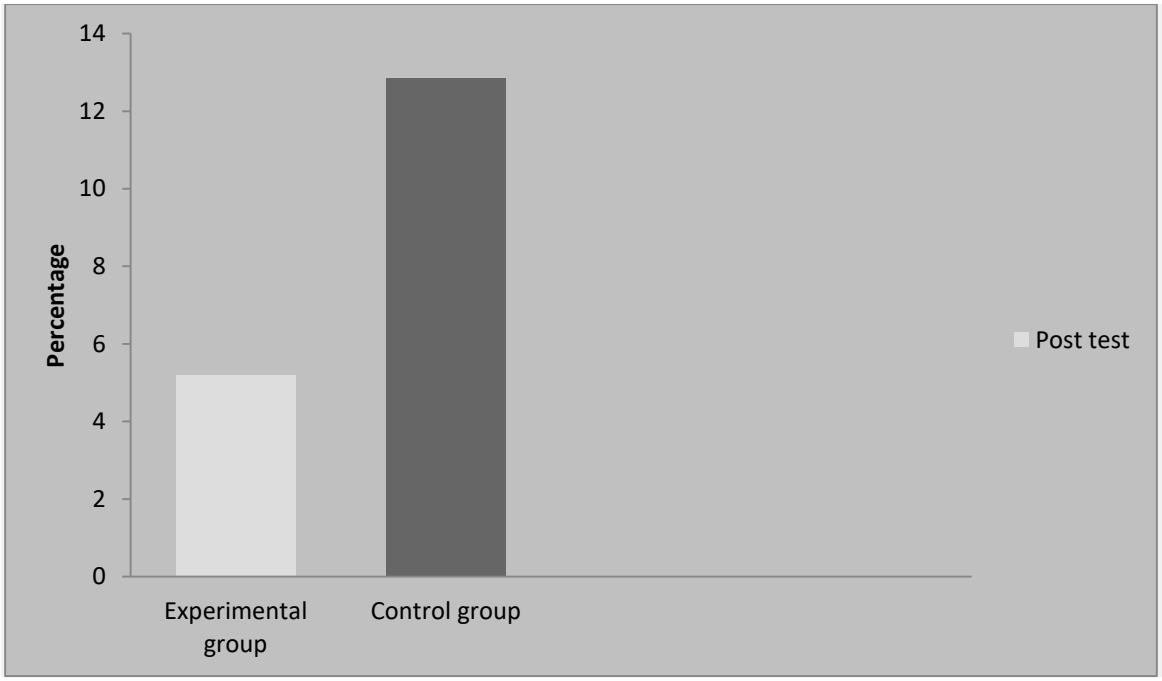

Figure 14 Comparision of post test level of lower extremity perfusion score in Left leg among patient with diabetes mellitus in experimental and control group

SECTION IV

TABLE 9

Association between the post test level of lower extremity perfusion in Right legamong patients withtype2 diabetes mellitus in experimental group with their selected demographic and clinical variables.

SN0	Demographicvariables	Experimental group(n-30) (Level of perfusion)		χ^2	df	P'value
		Adequate (f) 13	Moderately Adequate (f) 17			
1.	**Age**					
	40-55 years	0	0			
	56-70years	13	9	8.52	1	0.003*
2.	71-85 yea	0	8			
	Sex					
	Male	7	9	0.009	1	0.78#
	Female	6	8			
3.	**Maritalstatus**					
	Married	13	17	0	0	0#
4.	Un married	0	0			
	Religion					
	Hindu	6	8	0.62	2	0.83#
	Christian	6	8			
	Muslim	1	1			
5.	**Eduction**					
	Noformaleducation	4	6	0.096	3	0.96#
	Middle school	4	5			
	Higher secondary	4	5			
	Gradute	1	1			
	Dietarypattern					

6	Vegetarian					
	Non vegetarian	3	1			
7.	**Type of job**	10	16	1.9	1	0.3#
	Sedentry					
	Moderate work	3	3			
	Heavy work	2	1			
	None	2	5	1.86	3	0.8#
8.	**Duration of DM**	6	8			
	Less than 5 years					
	6 – 10 years	0	0			
	More than 10 years	8	4			
9	**Associated Illness**	5	13	4.43	1	0.04*
	Hypertention					
	Renal problem	10	6			
	Cardiac problem	2	6			
10	**Family history of PAD**	1	5	5.22	2	0.06#
	Yes					
	No	1	8			
		12	9	5.44	1	0.02*

*Significantat 0.05 level

Table 9 shows to find out if there is any association between the post test level of lower extremity perfusion among patients withtype2 diabetes mellitus and selected demographic variables like age, sex, marital status, religion, education , duration of diabetes mellitus, dietary pattern, type of job, associated illness,and family history of peripheral artery disease.

H03;There will be significant association between the post test score of lower extremity perfusion among patients withtype2 diabetes mellitus and selected demographic andclinicalvariables.

The above table predict that the demographic and clinical variables such asage($\chi 2$ value 8.82 df 1),Duration of illness($\chi 2$ value 4.43 df 1), and family history of PAD($\chi 2$ value 4.43 df 1) which is Significant at $p<0.05$ level. Where as other demographic variables are not Significant at $p <0.05$ level. Therefore the researcher partially reject the null hypothesis and partially accepts the research hypothesis for accepts age,Duration of illness, and family history of PAD.

TABLE 10

Association between the post test level of lower extremity perfusion in Right leg among patients withtype2 diabetes mellitus in control group with selected demographic and clinical variables.

SN0	Demographic variables	Control group(n-30) (Level of perfusion)		χ^2	df	'P'value
		Inadequate (f) 15	Severely inadequate (f) 15			
1.	**Age**					
	40-45 years	0	0			
	56-75 years	13	7	5.81	1	0.025*
	71-85 years	2	8			
2.	**Sex**					
	Male	9	8	0.14	1	0.68#
	Female	6	7			
3.	**Maritalstatus**					
	Married	15	15	0	0	0#
	Un married	0	0			
4.	**Religion**					
	Hindu	8	7			
	Christian	6	7	0.152	2	0.916#
	Muslim	1	1			
5.	**Eduction**					
	No formal education	4	5			
	Middle school	5	5			
	Higher secondary	5	5	1.11	3	0.820#
	Gradute	1	0			
6	**Dietarypattern**					
			1			

	Vegetrian	2	14	0.37	1	0.73#
	Non vegetrinan	13				
			3			
7.	**Type of job**	3	0		3	0.69#
	Sedentry	2	3	1.74		
	Moderate work	4	9			
	Heavy work	6				
	None		0			
8.	**Duration of DM**	0	3		1	0.016*
	Less than 5 years	10	12	6.65		
	6 – 10 years	5				
	More than 10 years		7			
	Associated Illness	10	5		2	0.588#
9.	Hypertention	3	3	1.22		
	Renal problem	2				
	Cardiac problem					
10.	**Family history of PAD**		7		1	0.021*
	Yes	1	8	6.13		
	No	14				

. The above table predict that the demographic variable such as age(χ2 value 5.81 df 1),Duration of illness(χ2 value 6.65 df 1), and family history of PAD(χ2 value 6.13 df 1), has significant association with post test level of perfusion where as other demographic variables there is no association with post test level of lower extremity perfusion

TABLE 11

Association between the post test level of lower extremity perfusion in Left leg among patients withtype2 diabetes mellitus and selected demographic and clinical variables.

SN0	Demographicvariable	Experimental group(n-30) (Level of perfusion)		χ2	df	'P'value
		Adequate (f) 14	Moderately Adequate (f) 16			
1.	**Age**					
	40-45 years	0	0			
	75 years	13	9	5.12	1	0.028*
	71-85 years	1	7			
2.	**Sex**					
	Male	9	7	0.45	1	0.59#
	Female	5	9			
3	**Maritalstatus**					
	Married	14	16	0	0	0#
	Un married	0	0			
4.	**Religion**					
	Hindu	8	6	0.71	2	0.79#
	Christian	5	9			
	Muslim	1	1			
5.	**Eduction**					
	Noformaleducation	4	6			
	Middle school	4	5	1.44	3	0.721#
	Higher secondary	5	4			
	Gradute	1	1			

6.	**Dietarypattern**					
	Vegetrian	2	2			
	Non vegetrinan	12	14	0.54	1	0.510#
7	**Type of job**					
	Sedentry	2	4			
	Moderate work	2	1	1.03	3	0.86#
	Heavy work	3	4			
	None	7	7			
8	**Duration of DM**					
	Less than 5 years	0	0			
	6 – 10 years	9	3	6.45	1	0.018#
	More than 10 years	5	13			
9.	**Associated Illness**					
	Hypertention	7	8			
	Renal problem	4	5	0.08	2	0.98*
	Cardiac problem	3	3			
10	**Family history of PAD**					
	Yes	1	8	0.013	1	0.013*
	No	13	8			

*Significantat 0.05 level

Table 11 shows

To find out if there is any association between the post test level of lower extremity perfusion score in left leg among patients withtype2 diabetes mellitus and selected demographic variables like age, sex, marital status, religion, education , duration of diabetes mellitus, dietary pattern, type of job, associated illness, and family history of PAD

H03;There will be significant association between the post test score of lower extremity perfusion among patients withtype2 diabetes mellitus and selected demographic and clinical variables.

The above table predict that the demographic and clinical variable such as age($\chi 2$ value 5.12df 1),Duration of illness($\chi 2$ value 6.45df 1), and family history of PAD($\chi 2$ value 6.53df 1),which is Significant at $p<0.05$ level. Where as other demographic variables are not Significant at $p <0.05$ level. Therefore the researcher partially reject the null hypothesis and partially accepts the research hypothesis for accepts age, Duration of illness, and family history of PAD.

TABLE 12

Association between the post test level of lower extremity perfusion in Left leg among patients withtype2 diabetes mellitus in control group with selected demographic and clinical variables. n= 60

SN0	Demographic variables	Control group(n-30) (Level of perfusion)		χ2	df	'P'value
		Inadequate (f) 15	Severely inadequate (f) 15			
1.	**Age**					
	40-45 years	0	0			
	56-75 years	8	12	5.41	1	0.025*
	71-85 years	7	3			
2.	**Sex**					
	Male	9	8	0.135	1	0.89#
	Female	6	7			
3.	**Maritalstatus**					
	Married	15	15	0	0	0#
	Un married	0	0			
4.	**Religion**					
	Hindu	8	7	0.15	2	0.88#
	Christian	6	7			
	Muslim	1	1			
5.	**Eduction**					
	No formal education	4	5			
	Middle school	4	6			
	Higher secondary	6	4	1.92	2	0.44#
	Gradute	1	0			
	Dietarypattern					

6	Vegetrian	2				
	Non vegetrinan	13	1	0.37		0.63#
	Type of job		14		1	
7.	Sedentry	4				
	Moderate work	2	2	4.46		0.364#
	Heavy work	4	0		3	
	None	5	3			
	Duration of DM		10			
8.	Less than 5 years	0				
	6 – 10 years	10	0	6.65		0.01*
	More than 10 years	5	3		1	
	Associated Illness		12			
9.	Hypertention	9				
	Renal problem	4	8	0.26		0.62#
	Cardiac problem	2	4		1	
	Family history of PAD		3			
10.	Yes	1				
	No	14	7	6.13		0.018*
			8		1	

The above table predict that the demographic variable such as age(χ2 value 5.41df 1),Duration of illness(χ2 value 6.65 df 1), and family history of PAD(χ2 value 6.13 df 1), has significant association with post test level of perfusion where as other demographic variables there is no association with post test level of lower extremity perfusion.

CHAPTER V

RESULT AND DISCUSSION

The main aim of the study was to assess the effectiveness of buergerallen exercise on level of lower extremity perfusion among patients with type 2 diabetes mellitus in selected hospitals at Kanniyakumari District.

The study was conducted by using Quasi experimental Pre testpost test control group design. The tool consists of demographic variables, Ankle Brachial Index Scale and Modified Inlow's 60-second diabetic foot assessment scale for selected clinical features of PVD to assess the Lower extremity perfusion. The main study was conducted from 05.02.18 to 05.03.15 on 60 patients admitted with type 2diabetes mellitus who met the inclusion criteria and selected by non-probability purposive sampling technique. After the selection of sample, the level of PVD was assessed by using the Ankle Brachial Index Scale and the level of lower extremity perfusion was assessed by using Modified Inlow's 60-second diabetic foot assessment scale. Buerger Allen Exercise intervention was administered three times per day with 3 hours interval for the period of 5 days on patients with type 2 diabetes mellitus After 5 days of Buerger Allen Exercise, post test was conducted on the samples using the Ankle Brachial Index Scale and Modified Inlow's 60-second diabetic foot assessment scale. The descriptive statistics (frequency, percentage, mean, standard deviation) and inferential statistics ('chi'square, paired t test) were used to analyze the data and to test the study hypotheses.

Distribution of the level of lower extremity perfusion among patient with diabetes mellitus according to the demographic variables in experimental and control group.

Distribution of the level of lower extremity perfusion among patient with diabetes mellitus according to age in experimental group,73.3% were between the age group of 56 – 70 years and26.7%were between the age group of 71 -85 . In control group most of the patients66.7% were between the age group of 56 – 70 years, and 33.3% were between the age 71 -85 years. According to sex majority of the patients in experimental group 53.3% were male and 46.7% were female. In control group 56.7% were maleand43%

were female. Regarding marrital status in both experimental and control group all are married. According to religion in experimental group 46.7% were hinduand 46% were christian, In control group mostofthe patients 50% were hindu, 43.33% were christian, and 6.67% of them muslim in both group.

Regarding the educational level in experimental group nearly 10(33.3%) patients were no formal eduction, 30% were studied in middle school, , 9(30%) studied in higher secondaryand 6.7% were Graduate. Sameas in control group nearly 30% patients were no formaleduction ,33% were studied middle school, 33.3 studied higher secondaryand only one Graduate. Related to the dietary pattern in experimental group 13.3% patients were vegetarian, and majority of the patients 86.7% were non vegetarian. Same as in control group 10% patients were vegetarian, and majority of the patients 90% of them non vegetarian. Considering the type of job, in both experimental and control group, nearly half of them 50% not doing any job, 20% were in sedentary workers, 6.7%were moderate workers, and 23.33% belongs to heavy workers.

Frequency and percentage distribution of the level of lower extremity perfusion among patients with diabetes mellitus according to the clinicalvariables in experimentaland control group.

According to clinical variables the duration of DM in exprimental group 40% patients were diagnosed 6 – 10 years duration and 60% were more than 10 years duraion. In control group 43.3%patients were diagnosed 6 – 10 years duration and 60% were more than 10 years duraion. Considering associated illness most of the patient in experimental group 50% were hypertention, 30% patients were with renal problem, and 20% patients with cardiac problem.in control group majority of the patients 17(56.7%) were hypertention, 26.7% were with renal problem, and 16.7% were with cardiac problem.

. Regarding family history of PAD in experimental group 30% of them family had the history of PAD, and 70% of them family there is no history of PAD. In control group group 26.7% of them family had the history of PAD, and 73.3% of them family there is no history of PAD

The first objective of the study was to assess the levels of lower extremity perfusion among patients with type 2 diabetes mellitus in both experimental and control group.

The study reveals that before the intervention of Buerger Allen Exercise in experimental group 14(46.7%) patients had Inadequate perfusion, 16(54.3%) had severely inadequate perfusion and none of them hadadequateandmoderatelyadequate perfusion. After the Buerger Allen Exercise 13(43.3%) patients had adequate level of lower extremity perfusion, 17(56.7%) had amoderatelyadequate perfusionand none of them had inadequate and severely inadequate perfusion.

In the control group 15(50%) patients had severely inadequate perfusion, 15(50%) had inadequate perfusion, and none of them had moderate andadequate perfusion in pre test. And there was no change in post test

This study finding was supported by Likhila Abraham: 2015 A study to assess the effectiveness of structured teaching programme on knowledge regarding varicose vein and practice of Buerger Allen Exercise in improving peripheral perfusion among workers in a Tile Factory at Mangalore. The investigator selected pre experimental one group pretest- post test design. Total samples consisted of 60 male workers based on simple random sampling technique was used to select the desired size of workers. The workers knowledge on varicose vein was assessed with interview method and perfusion of extremity was measured using check list. In this study the pretest mean score of peripheral perfusion was 18.33 and also 39(65%) had mild symptoms, 21(35%) had moderate symptoms of reduced perfusion.

Balaha M.H.et. al (2010) conducted a study on Effect of Buerger Exercise on lower extremity perfusion among 250 patients admitted in medical wards at King Faisal University Hospital, Saudi Arabia. ABI was used to diagnose PAD. PAD was diagnosed in 35.6% of cases, distributed as 45% mild, 32.6% moderate and 22.4% severe. So this study supports the present study. Where the researcher observed that the levels of lower extremity perfusion in patients with selected type 2 diabetes mellitus are low.

The second objective of the study to evaluate the effectiveness of buergerallen exercise on levels of lower extremity perfusion among patients with type 2 diabetes mellitus in experimental group.

After the 5 days of Buerger Allen Exercise post test was conducted by using ABI Scale and Modified Inlow's 60-second diabetic foot assessment scale . In Right leg the experimental group the mean post test perfusion score 4.93 were lesser than the post test perfuision score of control group 12.66. The obtained 't' value for level of perfusion on 16.17 were statistically significant at 0.001. This indicates the mean difference of 7.73 are true difference and has not occurred by chance. In left leg the experimental group the mean post test left leg perfusion score 5.20 were lesser than the post test perfuision score of control group 12.86. The obtained 't' value for level of perfusion on 15.19 were statistically significant at 0.001. This indicates the mean difference of 7.66 are true difference and has not occurred by chance. The above findings fail to support the null hypothesis. Hence the researcher rejects the null hypothesis and accept the research hypothesis.The data identified from the present study shows that the Buerger Allen Exercise on levels of lower extremity perfusion was effective among patients with selected type 2 diabetes mellitus.

Jissy Jacob(2013) Effectiveness of Buerger Allen Exercise on Peripheral Perfusion among patients with Type 2 Diabetes Mellitus in selected hospital, Bangalore. In this study also depicted that after the Buerger allen exercise in experimental group, the post test mean score of lower extremity perfusion among Type 2 DM was highest 2.40 (8.57%), which was improved than compared to the control group.

Priyanka Jayakumar (2014) a quasi experimental pre and post test control group design circulation among clients with diabetes mellitus in selected hospitals at Bangalore. The findings of the study revealed that post test mean score was 6.18, with standed deviation 2.2 paired 't' test value is 11.12 which is statistically significantat $p< 0.05$ level.

The third objective of the study was to find out the association between the post test levels of lower extremity perfusion among patients with type 2 diabetes mellitus and selected demographic variables.

The 'chi' square test was calculated to find out the association between the post test levels of lower extremity perfusion and selected demographic and clinical variables such as age($\chi 2$ value 8.82 df 1),Duration of illness($\chi 2$ value 4.43 df 1), and family history of PAD($\chi 2$ value 4.43 df 1) which is Significant at $p<0.05$ level. where as other demographic variables are not Significant at $p<0.05$ level. Therefore the researcher partially reject the null hypothesis and partially accepts the research hypothesis for accepts age, Duration of illness, and family history of PAD.

. Pranitha (2010) conducted to determine the effectiveness of Buerger Allen Exercise on lower extremity perfusion. It concluded that the computed 'chi'square value showed that there was no association between pre-test peripheral perfusion with selected variables such as age, education, BMI and dietary pattern at $p<0.05$ level of significance.

This study was supported by NishaGhimire (2013) conducted to determine the effectiveness of Buergerallen exercises in improving peripheral perfusion among Type II diabetes mellitus patients admitted in selected hospitals at Mangalore. The study results shows that chi-square value of occupation, type of work are statistically significant at $p<0.05$ level.

SUMMARY

In this chapter the findings of the present study were analysed and discussed with findings of other similar studies

CHAPTER - VI

SUMMARY, NURSING IMPLICATIONS AND RECOMMENDATIONS

This chapter deals with the summary, conclusion, nursing implications, limitations and recommendations for further study

The study concluded to find out the the effectiveness of buerge rallen exercise on lower extremity perfusion among patients with type 2 diabetes mellitus in selected hospitals at Kanniyakumari District

The following objectives of the study

- To assess the levels of lower extremity perfusion among patients with type 2 diabetes mellitus in both experimental and control group.
- To find out the effectiveness of buergerallen exercise on levels of lower extremity perfusion among patients with type 2 diabetes mellitus.
- To determine the association between the post test levels of lower extremity perfusion among patients with type 2 diabetes mellitus and the selected demographic variables such age, sex, marital status, religion, education, dietary pattern, type of job.
- To determine the association between the post test levels of lower extremity perfusion among patients with type 2 diabetes mellitus and the selected clinical variables suchduration of diabetes mellitus, associated illness, and family history of peripheralarterydisease.

HYPOTHESIS

H_1; The mean post test score of lower extremity perfusion will be significantly lower than the mean pre test score of lower extremity perfusion in experimental group who had buergerallen exercise

H_2; The mean post test score of lower extremity perfusion among patients with type2 diabetes mellitus in experimental group will be lower than the mean post test scoreof lower extremity perfusion in control group.

H_3; There will be significant association between the post test score of lower extremity perfusion among patients with type2 diabetes mellitus and selected demographic variables such as age, sex, marital status, religion, education, dietary pattern, and type of job.

H_4; There will be significant association between the post test score of lower extremity perfusion among patients with type2 diabetes mellitus and selected demographic variables such as duration of diabetes mellitus, associated illness, and family history of peripheral artery disease

SUMMARY

The study was conducted to evaluate the effectiveness of Buerger Allen Exercise on level of lower extremity perfusion among patients with type 2 diabetes mellitus admitted at Morris mathis Hospital and Mariadiabetic Centre, Kanniyakumari district. Review of literature was under taken from primary and secondary sources that formed the basis of selection of problem, formation of tool and conceptual framework. The conceptual framework of this study was Daniel stuffle Beam's CIPP Model. The research design used in the study was Quasi experimental Pre test post test control group design. The tool consists of demographic variables , Ankle Brachial Index Scale and Modified Inlow's 60 second diabetic foot screen scale. Five Experts validated the tool. Initially section A consisted of 10 demographic variables. In section B part I standardized tool ABI scale was used to assess the peripheral artery disease, part II-Modified Inlow's 60 second diabetic foot screen scale was used to assess the level of lower extremity perfusion as prepared by researcher. In section B the total items were increased from 5 to 6, based on the expert opinion and necessary changes were made in the section B.

The pilot study was conducted at Morris Mathias hospital, Nagercoil and Vinoth hospital, Marthandam, after obtaining formal permission from the Director of the

hospital. Pilot study was conducted in the month of February (19/2/18 to 24/2/18) for a period of one week.The study was found to be feasible to proceed with the main study.

The main study was conducted from 05.02.18 to 05.02.18 on 60 patients admitted with type 2 diabetes mellitus who met the inclusion criteria and were selected by Non probability purposive sampling technique. After the selection of sample, the level of lower extremity perfusion was assessed by using the Ankle Brachial Index Scale and Modified Inlow's 60 second diabetic foot screen scale. Then Buerger Allen Exercise intervention was administered three times per day with 3 hours interval for the period of 5 days. After 5 days of Buerger Allen Exercise, post test was conducted on the same samples using the same Ankle Brachial Index Scale and Check list. The descriptive statistics (frequency, percentage, mean, standard deviation) and inferential statistics. To test the hypothesis,paired 't'test and chi square test was used. The level of significance was assessed at $p<0.05$.

Major findings of the study

Distribution of pre testandpost test level of lower extremity perfusion among patient with type 2 diabetes mellitus in both experimentaland control group

The study findings reveal that before the intervention of Buerger Allen Exercise in right leg experimental group 14(46.7%) patients had Inadequate perfusion, 16(54.3%) had severely inadequate perfusion and none of them had adequate andmoderatelyadequate perfusion. After the Buerger Allen Exercise 13(43.3%) patients had adequate level of lower extremity perfusion, 17(56.7%) had a moderatelyadequate perfusion and none of them had Inadequateand severely inadequate perfusion. In the control group 15(50%) patients had severely inadequate perfusion, 15(50%) had inadequate perfusion, and non of them had moderate and adequate perfusion.This proves that Buerger Allen Exercise was effective. The overall pretest mean score with the standard deviation was 13.06±1.71 and the post test mean score with the standard deviation was 4.93± 2.01.

In left leg before the intervention of Buerger Allen Exercise in experimental group 15(50%) patients had Inadequate perfusion, 15(50%) had severely inadequate

perfusion and none of them had adequate and moderately adequate perfusion. After the Buerger Allen Exercise 14(46.7%) patients had adequate level of lower extremity perfusion, 16(53.3%) had a moderately adequate perfusion and none of them had Inadequate and severely inadequate. In the control group 15(50%) patientshad severely inadequate perfusion, 15(50%) had inadequate perfusion, and non of them had moderate and adequate perfusion.This proves that Buerger Allen Exercise was effective. The overall pretest mean score with the standard deviation was 12.9±1.84 and the post test mean score with the standard deviation was 5.20 ± 2.21.

Comparison of post test level of lower extremity perfusion among patient with diabetes mellitus in experimental and control group

To Compare the post test level of lower extremity perfusion score in Left leg among patient with diabetes mellitus in the experimental group the mean post test perfusion score 4.93 were lesser than the post test perfuision score of control group 12.66. The obtained 't' value for level of perfusion on 16.17 were statistically significant at 0.001. This indicates the mean difference of 7.73 are true difference and has not occurred by chance. The above findings fail to support the null hypothesis. Hence the researcher rejects the null hypothesis and accept the research hypothesis.

To Compare the post test level of lower extremity perfusion score in Right leg among patient with diabetes mellitus in the experimental group the mean post test left leg perfusion score 5.20 were lesser than the post test perfuision score of control group 12.86. The obtained 't' value for level of perfusion on 15.19 were statistically significant at 0.001. This indicates the mean difference of 7.66 are true difference and has not occurred by chance. The above findings fail to support the null hypothesis. Hence the researcher rejects the null hypothesis and accept the research hypothesis.

Association between the post test level of lower extremity perfusion among patients with type2 diabetes mellitus in experimentaland control group with their selected demographic variables

The chi squre test was calculated to find out the association between post test level of alower extremity perfusion and selected demographic and clinical variables such

as age($\chi 2$ value 8.82 df 1),Duration of illness($\chi 2$ value 4.43 df 1), and family history of PAD($\chi 2$ value 4.43 df 1) which is Significant at $p<0.05$ level. where as other demographic variables are not Significant at $p <0.05$ level. Therefore the researcher partially reject the null hypothesis and partially accepts the research hypothesis for accepts age, Duration of illness, and family history of PAD.

CONCLUSION

The present study assessed the effectiveness of Buerger Allen Exercise on level of lower extremity perfusion among patients with with type 2 diabetes mellitus who were admitted in Maria Diabetic centre and Morris Mathias hospital. The level of lower extremity perfusion was inadequate and severely inadequate perfusion before Buerger Allen Exercise. It was found that adequate and moderatly adequate

none of them had inadequate and severely inadequate perfusion after administration of Buerger Allen Exercise. It is evident that the Buerger Allen Exercise is effective in improving the lower extremity perfusion. The study also suggested that specific information and Buerger Allen Exercise has to be taught to the patients with type 2 diabetes mellitus in improving the level of lower extremity perfusion

NURSING IMPLICATIONS

The findings of the present study enables to determine the effectiveness of Buerger Allen Exercise on level of lower extremity perfusion. The findings of the study have several implications for nursing practice, nursing education, nursing administration and nursing research.

Nursing Practice

Health education is an important aspect of nursing practice. Nurses working in hospital as well as in the community can provide information develop skill (Buerger

Allen Exercise) and timely helps the Diabetes patientsto understand about the effect of Buerger Allen Exercise and manage the risk of Peripheral vascular disease.

Evidence based practice should be encouraged about use of Buerger Allen Exercise in nursing practice.

Nursing Education

Nurse educator can prepare the student nurses to practice the Buerger Allen Exercise in nursing care of patients with type 2 Diabetes.

Nurse educator may encourage student nurses to conduct project on Buerger Allen Exercise in different areas.

Nurse educator may divide the students in teams and encourage them to conduct variety of programmes on various aspects of Buerger Allen Exercise.

The study serves as a base for the nurse educator to teach on the recent trends of Buerger Allen Exercise techniques on evidence based practice.

Demonstration classes may be included asa part of in-service education to enhance the nurse's knowledge andskill inBuerger Allen Exercise.

Regular educational and practical sessions for nurses can be encouraged to improve knowledge and skill in administering Buerger Allen Exercise.

Continuing nursing education programs on Buerger Allen Exercise can be initiatedand conducted periodically.

Nursing Administration

The nurse administrator can take part in developing protocols related to designing the health education programmes and strategies about the effectiveness of Buerger Allen Exercise.

Nurse educator Can develop a protocol to Buerger Allen Exercises for all patients admitted with type 2 Diabetes.

Standard protocol can be prepared and administered for all patients at the risk of decreased lower extremity perfusion.

Nursing research

Nurse researcher can encourage clinical nurse to apply the research findings in their daily nursing care activities.

Dissemination of findings through conference, professional journals will make the application of research findings too effective on evidence based practice.

Evidence based practice should be encouraged about use of Buerger Allen Exercise in nursing research

LIMITATION

- The study was limited to patients with type 2 diabetes mellitus
- The study was limited to age group between 45-85 years
- Data collection period limited to 4 weeks only
- The sample size was small (60) hence generalization is not possible for a large population.

RECOMMENDATIONS

On the basis of the findings of the study, the following recommendations have been made for the further study:

The study can be replicated by using a large samples there by findings can be generalized.

A comparative study may be conducted to evaluate the effectiveness of Buerger Allen Exercise with other non-pharmacological measures for improving the level of lower extremity perfusion.

A descriptive study can be conducted to assess the knowledge and attitude of nurses towards various type of exercise for peripheral vascular disease.

A longitudinal study can be done on the patients withdiabetes to elicit the effectiveness of Buerger Allen Exercise.

The study can be conducted for different samples and in different settings there by findings can be generalized.

SUMMARY

This chapter shows that Buerger Allen Exercise is a simple nonpharmacological intervention which can be carried out independently in the field of nursing. The overall experience of conducting this study was enriching, hence it gave an opportunity to the investigator to acquire new information, skill as well as a rich learning experience. Theexperience of the investigator during the study and the findings helped the investigator to give suggestions.

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LETTER SEEKING PERMISSION TO CONDUCT THE STUDY

THASIAH COLLEGE OF NURSING

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LETTER SEEKING PERMISSION TO CONDUCT THE STUDY

From

The Principal,

Thasiah College of Nursing,

Marthandam.

To

The Medical Director,

Morris Mathias Hospital

Nagercoil.

Respected Madam / Sir

Sub : Seeking permission to conduct study in Morris Mathias Hospital

We wish to state that Mrs.Hemalatha.k, II Year M.Sc(Nursing)student of our college has to conduct a research project, which is to be submitted to the Tamilnadu Dr.MGR University,Chennai in partial fulfillment of University requirements. The topic of research project is "**A study to assess the effectiveness of Buerger allen exercise to improve lower extremity perfusion among type 2 diabetes Mellitus patients at selected hospitals in Tamil nadu**"

We therefore request you to kindly permit her to do the research work in your organization under your valuable guidance and suggestions.

Thanking you

Place : Marthandam

Date :

Yours faithfully,

PRINCIPAL
Thasiah College of Nursing
Marthandam - 629 165

LETTER FOR GRANTING PERMISSION TO CONDUCT A STUDY IN MARIA DIABETIC

THASIAH COLLEGE OF NURSING

(Approved by Govt. of Tamilnadu, TN-Nurses & Midwives Council Indian Nursing Council & Affiliated to Dr. M.G.R. Medical University)
Marthandam, Vellivilagam, Viricode - 629 165
Kanyakumari District. Tamil Nadu, India.
Phone : 04651 - 270996, 9487251600
web : www.tcnursing.net, email : info@tcnursing.net

LETTER SEEKING PERMISSION TO CONDUCT THE [redacted] STUDY

From

The Principal,

Thasiah College of Nursing,

Marthandam.

To

DR. A. Franklin Joseph M.B.B.S, D.Diab
Diabetologist
Maria Diabetic Centre

Respected Madam / Sir

Sub : – seeking permission to conduct a study.

We wish to state that Mrs. Hemalatha, II Year M.Sc(Nursing)student of our college has to conduct a research project, which is to be submitted to the TamilnaduDr.MGR University,Chennai in partial fulfillment of University requirement ''A Study to assess the effectiveness of Buerger allen exercise to improve lower extremity perfusion among type 2 diabetes mellitus patients at selected hospitals in Tamilnadu"

We therefore request you to kindly permit her to do the research work in your organization under your valuable guidance and suggestions.

Thanking you

Marthandam

Permission granted

Yours faithfully,

Principal

PRINCIPAL
Thasiah College of Nursing
Marthandam - 629 165

Dr. A. Franklin Joseph,
M.B.B.S., D.Diab
Reg. No. 40743
MARIA DIABETIC CENTRE
9/1, WATER TANK ROAD,
NAGERCOIL - 1

LETTER FOR GRANTING PERMISSION TO CONDUCT STUDY IN IN MORRIS MATHIAS HOSPITAL

Morris Mathias Hospital
MMH

05-03-2018

To,
The Principal
Thasiah College of Nursing
Marthandam
Kanyakumari Dist.

Dear Sir/Madam,

Sub: Granting of permission to conduct a study in our hospital for your M.Sc. (N) student Mrs.Hema Latha .K.

Ref: Your letter dated 29/01/2018

With reference to your letter cited above. We here by inform you that our hospital will be able to allow your M.Sc. (N) student Mrs.Hema Latha.K to conduct a study of Lower Extremity pertusion among Type2 Diabetes Mellitus Patients.

The Student must be in full uniform with name identity and Rs.500/ - to be pay as our institutional fees.

Thanking You,

Yours Sincerely

11/A/18

NURSING SUPERINTENDENT
MORRIS MATHIAS HOSPITAL
NAGERCOIL - 629 001

355, K.P. Road, Dr. Mathias Nagar, Nagercoil - 629 001.
Phone : (04652) - 279902, 279903, 279904, 279905, 9043079906, e-mail : morrismathiashospital@gmail.com

LETTER SEEKING EXPERTS OPINION FOR THE VALIDITY OF THE TOOL

From

K. Hema Latha

M.sc. Nursing II year,

Thasish college of Nursing

Marthandam

Respected sir/ Madam

Sub: Requisition to expect opinion and suggestion for content validity

I am Hemalatha .K., M.Sc. Nursing II year, Thasiah College of Nursing, Marthandam, have selected the following topic, " **A study to assess the effectiveness of Buerger Allen Exercise on lower extremity perfusion among type 2 diabetes mellitus patients"** for my dissertation to be submitted to Tamilnadu Dr. M.G.R. Medical University in the partial fulfillment of the requirement for award of Master of science in Nursing.

I request you to go through the items and give your valuable suggestion and opinions to develop the content validity of the tool. Kindly suggest modifications, addition and deletions if any in the remarks column.

Thanking You,

Place: Marthandam Yours Sincerely,

Date: - K Hemalatha

ENCLOSURE:

1. Problem statement, objectives, and hypothesis of the study.
2. Demographic profile.
3. Numerical pain rating scale.
4. Evaluation Performance.

EVALUATION CRITERIA CHECK LIST FOR VALIDATION

INTRODUCTION:

The expert is requested to go through the following criteria for evaluation. Three columns are given for responses and a column for remarks. Kindly place tick mark in the appropriate column and given remarks.

Interpretation of Column:

Column I : Meets the criteria.

Column II : Partially meets the criteria.

Column III : Does not meet the criteria.

S.No	Criteria	1	2	3	Remarks
1`	Scoring – Adequacy – Clarity – Simplicity				
2	Content – Logical Sequence – Adequacy – Relevance				
3	Language – Appropriate – Clarity – Simplicity				
4	Practicability – It is easy to Score – Does it pres – Utility				

Signature Any other Suggestion

Name

Designation

Address

LIST OF EXPERT WHO HAVE DONE VALIDATION OF THE TOOL

1.Dr.Franklin joseph M.B.B.S, D.Diab
Diabetologist
Maria Diaetic centre

2.Dr.Samuel Ben Solomen
(General Medicine) Consultant
Morries Mathias Hospital

3.Mrs.Crystal Jancy (M.sc Nsg)
Assistant professor,
White Memorial College of Nursing,

4.Mrs.Brightrick Jolio (M.sc Nsg)
Assistant professor,
White Memorial College of Nursing,

5.Mr.V.Sam Daniel Raj D.P.T,PDPT
Senior physiotherapist
Morries Mathias Hospital

Informed consent for project

Informed Consent for Project

Name: …… Age…….Sex……..

I hereby give informed consent to answer the questionnaire for evaluating the effectiveness of……

I have been informed about the Buerger Allen Exercise that Mrs.Hemalatha going to teach to me and I know by doing these are no side effects. I, hereby willingly give my consent to participate in this project. I am also aware that, I can refuse to participate and that will not affect my treatment in any way.

Signature of the patient Date/Time

செயல்முறைகளுக்கான ஒப்புதல் படிவம்

பெயர் : ..... வயது..... பாலினம் .....

நான் ..... பர்கர் ஆலன் பயிற்சி பற்றிய கேள்விகளுக்கு பதில் அளிக்க சம்மதிக்கிறேன்.

எனக்கு இந்த செயல் முறை பற்றி **திருமதி. ஹேமலதா** கற்றுத்தரபோகிறார். என்றும் இந்த செயல் முறை செய்வதால் எந்தவித பின்விளைவுகளும் இல்லை என்பதையும் நன்கு அறிவேன். எனவே நான் முழு மனதுடன் இந்த செயல் முறைக்கு என் விருப்பத்துடன் சம்மதத்தை தெரிவிக்கிறேன். எனக்கு இந்த செயல் முறை வேண்டாம் என்றால் அதை நான் மறுக்கவும் என்னால் முடியும் என்பதையும் இது எந்தவகையிலும் என்னுடைய சிகிட்சையைபாதிக்காது என்பதையும் நான் அறிந்துள்ளேன்.

நோயாளியின் கையொப்பம் தேதி/நேரம்

CERTIFICATE FOR TRAINING IN BUERGER ALLEN EXERCISE

PARC HOSPITAL
GOOD BYE - TO PAIN AND PARALYSIS
Market Road, (Near Mathy Broilers) Marthandam.
Ph. : 04651 - 274100, www.parchospital.com

Date : .....

CERTIFICATE

This Is to certify that **Mrs.Hema Latha M.Sc** II year student of Thasiah College of Nursing , Marthandam has undergone the **physiotherapy training in peripheral arterial disease** for a period of one month at this centre from 15th December 2017 to 15th January 2018.

During the period her behavior and therapy training with the patient was good .Her conduct and character were good.

Dr. S. GIRISH KUMAR, PT.,Ph.D(Hon)
Reg. No: 7366

CERTIFICATE FOR TAMIL EDITING

TO WHOM SO EVER IT MAY CONCERN

This is to certify that the tool developed by Mrs. Hemalatha., II year M.Sc Nursing students of Thasiah College of Nursing Marthandam for dissertation "A study to assess effectiveness Buerger allen exercise on lower extremity prefusion among type 2 diabetes mellitus." is edited for Tamil language and its appropriateness.

Signature

CERTIFICATE FOR ENGLISH EDITING

TO WHOM SO EVER IT MAY CONCERN

This is to certify that the tool developed by Mrs. Hemalatha , II year M.Sc Nursing student of Thasiah College of Nursing, Marthandam for dissertation "A study to assess the effectiveness of Buerger Allen exercise on lower extremity profusion among type 2 diabetes patients in selected hospitals at Kanniyakumari district is edited for English language and its appropriateness.

C. JAGAN, M.A., M.Phil
SIVA SAKTHI COMMERCIAL SCHOOL
Market Road, Marthandam P.O.
Kanyakumari District

Signature

TOOL FOR DATA COLLECTION

SECTION - A STRUCTURED QUESTIONNARIE FOR THE DEMOGRAPHIC VARIABLES.

Dear participants you are requested to answer all items. This information will be treated as confidential. Kindly put a (√)to answer to which you respond in the specific column, provided in the right side of the questionnaire.

1) Age

a) 40 – 55

b) 56 – 70 Years

c) 71 – 85 Years

2) Sex

a) Male

b) Female

3) Marital status

a) Married

b) Unmarried

4) Religion

a) Hindu

b) Christn

c) Muslim

5) Education

a) No formal education

b) Middle

c) Higher secondary

b) Graduate

6) Dietary pattern

a) Vegetarian

b) Non vegetarian

7) Type of job

a) Sedentary

b) Standing

c) Both sedentary and standing

d) None

SECTIO-B CLINICAL VARIABLE

1) Duration of Diabetes mellitus

a) Less than 5 years

b) 6 – 10 years

c) More than 10 years

2) Associated illness

a) Hypertension

b) Renal problem

c) Cardiac problem

3) Family history of peripheral artery disease

a) Yes

b) No

தன்னிலை விபர குறிப்பு

1. வயது
    a. 40-55 வருடங்கள்
    b. 56-70 வருடங்கள்
    c. 71-85 வருடங்கள்
2. இனம்
    a. ஆண்
    b. பெண்
3. திருமணநிலை
    ய. திருமணமானவர்
    டி. திருமணமாகாதவர்
4. சமயம்
    a. இந்து
    b. கிறிஸ்தவர்
    c. முஸ்லீம்
5. கல்வி
    a. கல்வி கற்காதவர்
    b. இடைநிலை
    c. உயர் நிலை
    d. கல்லூரி
6. உணவின் நிலை
    a. சைவ
    b. அசைவம்
7. வேலையின் நிலை
    a. உடல் உழைப்பு இல்லாத வேலை
    b. நின்று கொண்டிருப்பது
    c. உடல் உழைப்பு இல்லாமல் நின்று கொண்டிருப்பது
    d. ஒன்றும் இல்லை
8. நிரிழிவின் காலம்
    a. 5வருடத்திற்கும் குறைவாக
    b. 6-10 வருடம்
    a. 10 வருடத்திற்கும் மேல்

9. எதாவது தொடர்புடைய நோய்

   a. உயர் இரத்த அழுத்தம்

   b. சிறு நீரக பிரச்சனை

   c. இதய பிரச்சனை

10. குடும்பத்தில் தமனி பிரச்சனை யாருக்காவது உள்ளதா?

   a. ஆம்

   b. இல்லை

Modified Inlow's 60 Second Diabetic Foot Screen

Patient Name:

IP NO : **Date:**

S.No	Look – 10 seconds	Score		Care Recommendations
		Left Foot	Right Foot	
1.	**Skin Colour** 0 = Normal 1 = Pale skin (Under perfusion) 2 = Dark Blue (Venous insufficiency)			
2.	**Cyanosis** 0 = Absent 1 = Present			
	Touch – 20 Seconds			
4.	**Temperature** 0 = Warm 1 = Hot (Insufficient venous supply) 2 = Cool (Inadequate arterial Supply			
5.	**Capillary Refill** 0 = < 2 second 1 = > 3 second			
6	**Swelling** **0 =** None 1 = Trace 2 = Mild 3 = Moderate 4 = Severe			
	Assess – 30 seconds			
7	**Sensation – Ask 4 Questions** i. Are your feet ever numb? ii. Do you ever tingle? iii. Do they ever burn? iv. Do they ever feel like insects are crawling on them? 0 = no to all questions 1 = yes to any of the questions			
8	**Pedal Pulse** **0** =Present **1** = Absent			

	Pain			
	0 = None (0) 1 = Mild (1-3) 2 = Moderate (4-6 3 = Severe (7-10)			
	ABI index **0** = Normal (>0.90) 1 = Mild PDA (<0.89 - >0.60) 2 = Moderate PAD (<0.59 - >0.40) 3 =Severe PAD (<0.39)			
Total score				

Scoring and Interpretation

0 - 3 = Adequate perfusion

4 – 8 = Moderately Adequate perfusion

9 – 13 = Inadequate perfusion

14 – 18 = Severely inadequate perfusion

மாற்றி அமைக்கப்பட்ட இன்லாஸ் 60 நெடி நீரிழிவு கால திரை மதிப்பீடு

நோயாளியின் பெயர் உள்நோயாளி எண்		தேதி:		
எண்	பார்வை நிமிடம்	இடதுபாதம்	வலதுபாதம்	பராமரிப்பு பரிந்துரைப்பு:
1.	தோலின் நிறம் 0- பொதுவான நிறம் 1- வெளறிய தோல் 2- இருண்ட தோல்			
1.	நீல்வாதை 0- இல்லை 1- உள்ளது			
2.	வெப்பநிலை 0- வெதுவெதுப்பான 1- சூடான(போதுமான சிரை சப்ளை) 2- குளிரான (போதுமான தமனி சப்ளை)			
3.	தமனிகள் நிரப்புதல் 0 = < 2 நிமிடம் 1 = < 3 நிமிடம்			
4.	வீக்கம் 0 இல்லை 1 சின்னஅளவில் 2 லேசான 3 மிதமான 4. கடுமையான			
5.	உணர்வு 1. உங்கள் கால்களில் முணுமுணுப்பு உணர்வு உள்ளதா? 2. கூச்ச உணர்வு உள்ளதா? 3. எரிச்சல் உணர்வு			

	உள்ளதா? 4. பூச்சிகள் ஊர்ந்து செல்லும் உணர்வு உள்ளதா? 0- ஒன்றும் இல்லை 1- ஒன்று உள்ளது			
6.	பாத துடிப்பு 0- ஆம் 1- இல்லை			
7.	வலி 0 - இல்லை 1 – லேசான 2 – மிதமான 3 - கடுமையான			
8.	0- சாதாரணம் (>0.90) 1 – லோசான (<0.89 - >0.60) மிதமான (<0.59 - >0.40) 3 – கடுமையான (<0.39)			
	மொத்த மதிப்பு			

மதிப்பெண் மற்றும் விளக்கம்

0-3 = போதுமான மேற்பரவல்

4-8 = மதிமான, போதுமான மேற்பரவல்

9-13 = போதிய இடைவெளி இல்லை

14-18 = கடுமையான போதிய இடைவெளி இல்லை

BUERGER'S ALLEN EXERCISE

Introduction

Buerger exercises is a system of exercises for arterial insufficiency of lower limbs, consisting of legs elevation, followed by dependency of the legs, and finally horizontal position of legs for rest. Published in 1924 by Leo Buerger (1879-1943), New York physician. Buerger exercises augmented by active exercises of the feet. These exercises consist in flexion, extension, and circumduction of the ankles and are done during the phase of dependency of the legs, as suggested in 1931 by Arthur W. Allen (1887-1958)

Definition:

Buerger-Allen exercise is an Specific exercises intended to improve circulation to the feet and legs. also relieve the symptoms in patients with lower limbs arterial insufficiency,

(Buerger,1926)

Benefits of Buerger's Allen exercise

- Improves lower limbs circulation
- Increases the rate of blood flow
- Prevent and treat diabetic foot problems
- Improves the walking ability,
- Rreduces necrosis, venous embolism, pain, swelling, cyanosis and the bed-rest time

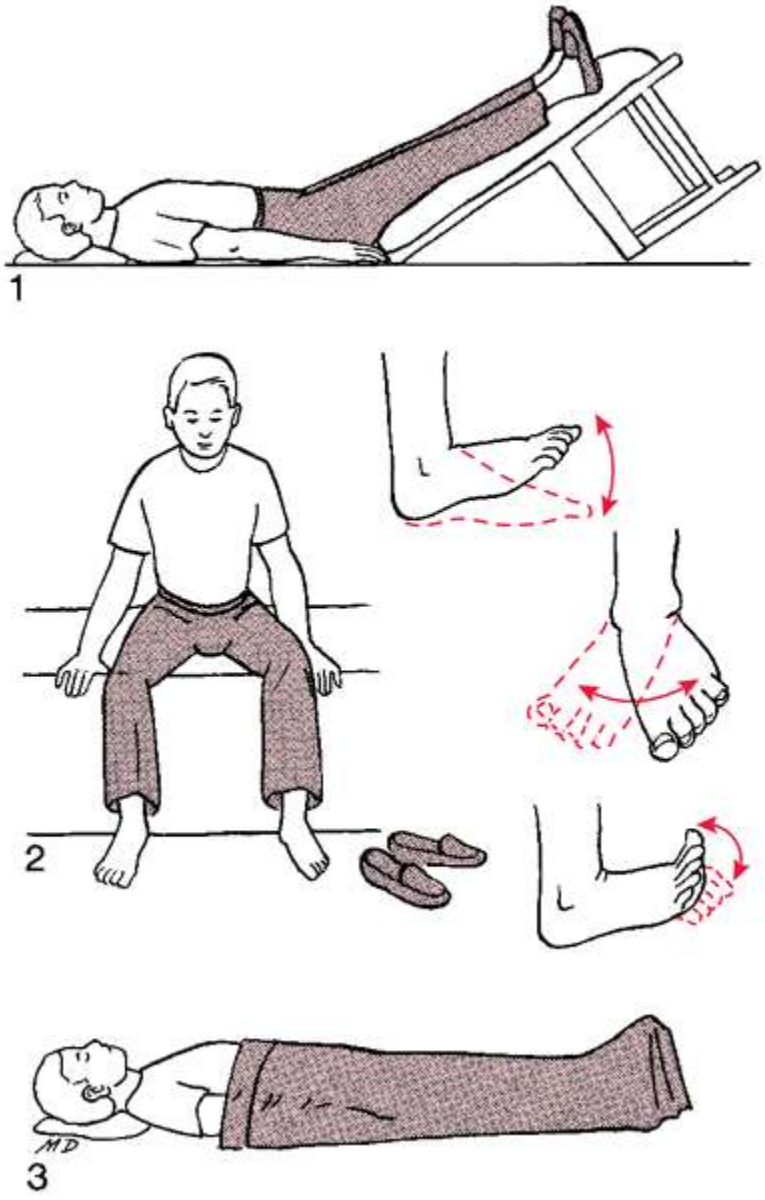
Mechanism of Buerger's Allen exercise

The mechanism of Buerger's exercises use gravitational changes in positions that are applied to the smooth musculature of vessels and to the vascular . Gravity helps alternately to empty and fill blood columns, which can eventually increase transportation of blood through them . The exercises involve the individual lying flat in bed with the legs elevated at 45 degrees until blanching occurs or for a maximum of 2 minutes. The patient then sits on the edge of the bed with the feet hanging down. Further exercises include dorsiflex, plantarflex, then inward and outward movement of the feet, followed

by flexing and extending of the toes. This second phase is maintained for a minimum of 2 minutes or until rubor has appeared. Finally, the individual lies supine with the feet covered with a warm blanket lasting 5 minutes. The whole cycle is repeated 3 to 6 times each session, and the complete sequence is repeated 2 - 4 times a day

Arthur W. Allen ,1931

STEPS OF PROCEDURE



Step 1 – General instruction

- Establised and maintain a trustworthy relationship
- Self introduction about the importance of lower extremity perfusion and benefits of Buerger allen exercise.

Step 2 – Preparation

- Explain the procedure to the patient
- Provide comfortable bed

Step 3 – Buerger allen exercises

- Buerger allen exercises intended to improve circulation to the feet and legs.
- The lower extremities are elevated to a 45 to 90 degree angle and supported in this position until the skin blanches.
- The feet and legs are then lowered below the level of the rest of the body until redness appears (care should be taken that there is no pressure against the back of the knees);
- finally, the legs are placed flat on the bed for a few minutes.
- The procedure given three times per day with 3 hours interval for the period of 5 days.

Step 4 – After care

- Once finised check the pedal pulse
- Find out any discoloration in lower extremity

PHOTOGRAPHS